Basic Principles in Surgical Oncology

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To talk about basic principles in surgical oncology, I need to explain how I arrived at them, how my experiences in surgery led me to espouse them, and how I became foolhardy enough to inflict them on you! As a psychology major at Amherst College, I only went to medical school to be a psychiatrist, but my exposure to surgery was so exciting that I considered changing plans. However, while attracted to surgery, I was also fearful of its demands. At a weekend visiting my parents, the husband of one of mother's best friends talked about how he had picked a challenging and preoccupying career to be sure that he was constantly engaged, challenged, and free of boredom. That brief snatch of conversation somehow helped convince me to launch into surgery.

Little did I realize how engrossing it could become! After Cornell Medical School I wound up at the Tufts Service at Boston City Hospital (BCH) under Gardner Child, my first surgical mentor, along with his associate program director, Art Donovan. An underlying theme at BCH that has stayed with me ever since was "be radical with infection but conservative with cancer." While that admonition was a product of the environment at BCH with poor, elderly, infirm, and malnourished patients with advanced cancers, nevertheless, the overall lesson remained. For me a watershed event occurred at BCH when "Barney" Crile gave grand rounds just as he was beginning his challenge to surgeons about the place of radical mastectomy for breast cancer. His insight and determination to escape the then-current doctrine excited me then and does to this day. I was impressed that most cancer surgery at BCH in those days was based on tradition, and doctrine, not careful individualization of cases, nor rational thought. I resolved that that would be my mission: to bring rational thought to cancer surgery; besides, the alternative was a career in vascular surgery, and I did not like the idea of multiple operations on the same patient—many at night—and I was repelled by gangrene!

Six months at Pondville State Cancer Hospital, Pondville, Mass, was a stimulus to do the surgical fellowship at Memorial Sloan-Kettering Cancer Center. The only Boston academic who encouraged me in this was my BCH chief, Bill McDermott, who has been a major supporter throughout my career. At Memorial, between 1965 and 1967, the environment was intellectually stifling. While the volume of case material was truly staggering, and operations were performed rapidly and effectively to deal with the enormous volume, challenges to doctrine were greeted with derision and denial. As chief resident, I had the privilege of inviting speakers and chose, among others, Barney Crile, to talk about breast cancer. One senior member of the breast service refused to speak to me for 6 months, and the staff made it clear that exposure to such heresy was not appreciated. All this in an institution that 20 or 30 years before had been the pioneer in developing radical and supraradical cancer operations, themselves challenges to the established order. How soon innovation becomes doctrine! The then-fading Memorial Hospital approach of "more is better" in cancer surgery had explored the limits of radicalness, and the giants of the previous era were near the end of their careers. The first 2 hemicorporectomies for cancer were performed while I was the resident on the bone service, and they provided a vivid lesson of radical surgery limits.

The chance to see the entire sweep of human cancer was provided by rotations on all the anatomic services at Memorial Hospital: gynecology, thoracic, head and neck, urology, breast, colorectal, gas-

tric and mixed tumor with melanoma, and the bone service. They were all extraordinarily educational by virtue of the exposure to large numbers of patients, cancer problems, and operations. Understanding patient limits in physical and emotional recovery from hemipelvectomy, pelvic exenteration, commando jaw-neck resections, and radical gastrointestinal surgery provided a comprehensive view of cancer behavior, human fortitude, and physiological tolerance. The frequently advanced disease encountered at that time was truly astonishing—disease states we can't even recall or imagine in the 1990s—which fully justified efforts at appropriate radical surgery, but also raised issues of early detection, public and professional education, and prevention.

On my return to Boston, the Lahey Clinic provided a surgical environment that emphasized practicality, rapidity, and efficiency. The multispeciality clinic setting, with all physicians on salary and a collegial atmosphere, was and still is to me a model for providing quality medical and surgical speciality care. We would be lucky to see such an environment persist. My mentor there, Neil Sedgwick, was a master surgeon and a great human being, and I am delighted he is in the audience today. He was and is a model to so many of us. As an example of the experience of his era, Sedge finished his surgical career having performed more than 5000 thyroid operations as well as countless other procedures. You have to be an efficient and effective surgeon to get through that type of workload!

All this exposure and experience has led to my personal interpretation of cancer as a disease and surgical oncology as a discipline. Since one quarter to one third of general surgical practices consist of cancer patients, general principles in surgical oncology are critically important: they should be the underpinnings of our work for patients with cancer, and perhaps they justify my talk today. Recently as part of institutional reorganization I have encountered the option of not having a section of surgical oncology, a lack of recognition of what the discipline of surgical oncology can provide to a comprehensive surgical program and a well-rounded surgical residency training program. There are 4 American journals devoted to surgical oncology, a national society, and surgical oncology societies and journals in many countries around the world, ample evidence of the recognition of this specialty.

Let me apologize to many in the audience for an exploration of technical, biological, and professional concerns that may have little relevance to the world at large, and of our larger real concerns for population control, environmental salvage, meaningful lives, justice, humanity, or even good humor. Let me also disclaim any originality to thoughts expressed here today. I have been a cavalier and blatant procurer of ideas from others—from mentors, friends, colleagues, residents, students, patients, and the literature. This lifetime harvest of others' crops of ideas, policies, principles, and goals will enable me to inflict on you what I feel is important in a professional practice of caring for patients with cancer and surgical cancer management. Many of these ideas have been explored in reports to you at our annual meetings. Much of what I say will be controversial to some and frankly crazy to others, but my goal has always been to stir the pot, make us all think about what we do, and emphasize basic principles.

Because of competing demands on their professional time, general surgeons have, in recent years, turned over much of the management of cancer patients after operation to medical oncologists and radiation therapists. One of the prime goals of surgical oncology should be to educate, encourage, and enable general surgeons, with their common sense and practical orientation, to reassume active overall management of cancer patients, albeit respecting collaboration. Collaboration, to be useful, however, must be rational. I have literally not referred a patient to a radiation therapist or a medical oncologist for evaluation for adjuvant therapy in the past decade who has not been accepted for treatment. Such automatic treatment frequently defies logic and any sense of cost-benefit or risk-gain analysis. What this policy of blanket treatment means is that the surgeon makes decisions for adjuvant chemotherapy and radiotherapy! If we refer them, they get treated. Adjuvant and metastatic cancer treatment today frequently involves great effort, expense, and morbidity for marginal or elusive gains. Therefore, surgeons need to be sophisticated about cancer management: which situations deserve treatment, and which do not? What are the balances between gain and loss? The best method to ensure balanced rational care is a mutually respectful, multidiscipline cancer clinic or board where cases are presented and the surgeons know cancer care generally and can make their opinions heard.

Every week I see patients where the basic concepts of surgical oncology are either not appreciated or ignored. Thus, a review allows me to give a personal view and to encourage surgeons to maintain involvement with their cancer patients and provide practical, rational, and empathetic advice on overall management.

So with all this preliminary let's discuss basic principles in the land of surgical oncology. Biology is King; selection of cases is Queen, and the technical details of surgical procedures are the Princes and Princesses of the realm who frequently try to overthrow the powerful forces of the King or Queen, usually to no long-term avail, although with some temporary apparent victories.

In the world of surgical oncology
Biology is King
Selection is Queen
Technical maneuvers are the Prince and Princess
Occasionally the prince or princess tries to usurp the throne; they almost always fail to overcome the powerful forces of the King and Queen.

We must comprehend natural biological boundaries in the management of patients with cancer. We must put in perspective our technical abilities and feats. Yes, we can perform a left upper quadrant exenteration for gastric cancer, but does it make any sense? Absolutely not! Yes, we can resect liver metastases without any margin, but does it make any sense? Absolutely not! The recent enthusiasm of Japanese and European surgeons for radical stomach removal with accompanying radical lymphadenectomy merely replays an already learned lesson: technical wizardry cannot overcome biological restraints. That lesson has been taught again and again in

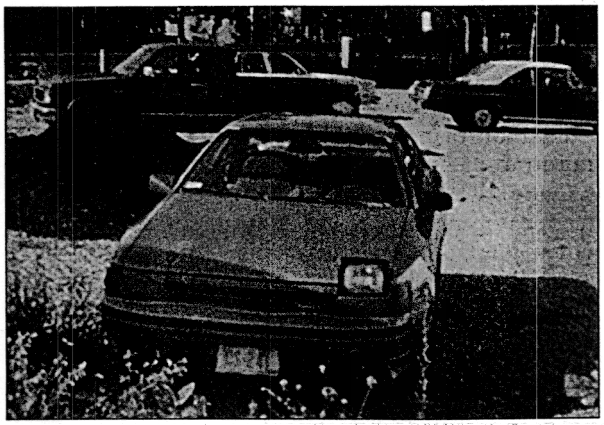

Figure 1. *My favorite example of change without progress is automobile folding headlights. They cost 10 times as much, break down frequently, do not light the road any better, and whenever they are up, destroy the streamlining that is the only excuse for installing them!*

breast cancer, melanoma, sarcoma, lung cancer, pancreatic cancer, colorectal cancer, and others, and reminds me that not all change is progress (**Figure 1**).

LOCAL RECURRENCE: AN INDICATOR BUT NOT GOVERNOR OF OUTCOME

To be more specific about biological principles in surgical oncology, let me first discuss local organ removal in the surgery of cancer. Local recurrence of cancer does not govern survival, except in unusual situations. Ample data demonstrate the indicating, but not governing, role of local recurrence in melanoma, sarcoma, and breast, colon, rectum, lung, gastric, and many other cancers. Reasonable surgical margins are adequate, and more radical resections of the primary organ do not improve survival. Routine excessive measures to reduce local recurrence that are a risk only for the minority of patients is inappropriate. I grew up, oncologically, on the dictum that 5 cm was the absolute minimum excision margin for melanoma. When Fred Bagley as a resident worked on a paper with me to explore the necessary margins in melanoma resection,[1] he found that the 5-cm margin doctrine was established by Sir Sampson Handley in 1907 in a Hunterian lecture based on a single case of a metastatic soft tissue nodule in the thigh of a young woman. Handley stated that 2 in was the appropriate tissue margin required based on his anatomic analysis of that single patient with a metastasis. He specifically regretted never having encountered a primary cutaneous melanoma on which to base his recommendations! With such tenuous threads is the noose of doctrine sometimes braided. Our understanding of necessary organ site margins has changed dramatically over the years. Appropriate margins have shrunk from 5 cm to 2 cm in colorectal cancer; from 5 cm to 2 cm or even 1 cm, depending on thickness, in routine melanoma cases; from amputation to wide excision of many extremity sarcomas, with adjuvant radiation therapy; from radical mastectomy to acceptance of even focally positive margins in local excision of breast cancer if radiotherapy is utilized adjuvantly; and to 1 cm of normal tissue if radiotherapy is not used in duct carcinoma in situ and in many small invasive cancers which

Table 1. Van Nuys Prognostic Index for Duct Carcinoma in Situ*

Predictor of Local Breast Cancer Recurrence	1 Point	2 Points	3 Points
Size, mm	≤15	16-40	≥41
Margins, mm	≥10	1-9	<1
Pathologic classification	Nonhigh grade without necrosis	Nonhigh grade with necrosis	High grade with or without necrosis

**Scores from each column are totaled to yield a Van Nuys Prognostic Index, where 3 is a low score and 9 is a high score (adapted from Silverstein et al[2]).*

do not have an extensive intraductal component. The recent development of the Van Nuys Prognostic Index by Silverstein et al[2] (**Table 1**) gives numerical scores to different margins and emphasizes the nature of a 1-cm margin as adequate in duct carcinoma in situ. Margin width is placed in the context of other biological features of size and histologic grade in duct carcinoma in situ with a numerical scoring system and may serve as a model for invasive breast cancer recurrence risk.

Radial margins, as well as mucosal margins, in rectum, pancreas, and stomach cancers have been recently reaccentuated and recognized to have an implication similar to the traditional organ wall margin. In liver resections for both hepatocellular and metastatic colorectal cancer, a 1-cm surgical margin of normal tissue has been repeatedly demonstrated to be as adequate as larger margins, and it enables smaller resections to be as satisfactory as hepatic lobectomies in achieving freedom from liver recurrence and long-term disease-free survival[3] (**Table 2**). The ability of adjuvant radiotherapy to compensate for smaller radial margins when such are necessary for cosmetic (as with breast cancer) or functional (as in sarcoma or rectal cancer) reasons have been defined.

In a few special situations, local failure may indeed cause a patient's death, and thus may occasionally become not only the indicator but also the governor of outcome. These situations were far more common in the 1950s but are relatively uncommon in the 1990s. Thus uncontrolled pelvic recurrence of rectal or cervical cancers, uncontrolled oral cavity or laryngeal recurrences in head and neck cancer, and uncontrolled extrahepatic biliary cancers can all cause death in and of themselves, but these are the exceptions regarding local recurrence that prove the rule: local recurrence is an indicator, not a governor, of outcome. Therapeutic trials in lung, gastric, colon and rectal, breast, endometrial, and head and neck cancers, melanoma, and sarcoma all attest to the fact that greater radicalness of primary organ resection is not accompanied by improved survival. Utilizing breast cancer as a model, chest wall recurrence after mastectomy is an indicator of metastatic disease but seldom causes major morbidity and essentially never causes death. Recurrence in a preserved breast, while it jeopardizes the patient's breast and is associated with a risk of metastatic disease, does not cause that metastatic disease. This is also true with melanoma and soft tissue sarcoma.

Table 2. Site of First Failure After Liver Resection of Metastatic Colorectal Carcinoma

Surgical Margin	% of Patients			
	Liver Only	Total Liver	Total Nonliver	No Recurrence
Negative, ≥1 cm (n=25)	12	36	28	60
Negative and close, <1 cm (n=33)	33	48	36	30
Positive (n=12)	67	100	33	0
P	.0037	.0011	NS*	.0013

*NS indicates no statistical significance.

Table 3. Percentages of Long-term Cancer Survivors With Lymph Node Metastases as Reported in 2 Studies

Type of Cancer	No. of Metastases*						
	0	1	2	3	4	5	>5
Harvey and Auchincloss[4] in 1968 (5- to 10-y follow-up)							
Stomach	73	11	5	2	2	2	2
Colorectal	73	13	5	3	2	1	3
Breast	70	13	7	5	2	1	3
Cady and Lalor in 1996 (10-y follow-up)							
Stomach	81	13	6	0	0	0	0
Colorectal	81	4	4	4	3	4	1
Lung	85	8	4	1	0	0	1
Breast	64	17	6	4	2	3	4

*Numbers are rounded off.

LYMPH NODE METASTASES: INDICATORS, BUT NOT GOVERNORS, OF SURVIVAL

Lymph node metastases are also indicators, but not governors, of survival. They are the speedometers of the oncologic vehicle, not the engine. The speedometer can be covered or even discarded—the biological engine still propels the system. Every trial conducted in human cancer that compares a more radical to a less radical lymphadenectomy has concluded that survival is not improved, but operative morbidity and sometimes even mortality is increased. In gastric cancer, recent clinical studies recommending supraradical lymph node resection demonstrate how short our biological and surgical memories are. Radical lymphadenectomy is merely the latest illustration of how concepts get recycled uncritically, sometimes requiring years of elaborately constructed, difficult to complete, and expensive trials to relearn past lessons. One can follow a 10-year or 20-year cycle of apparently new (but really old and forgotten) concepts to professorship and fame. Professions, like countries, that do not remember history are doomed to repeat it is an apt aphorism for the most recent upsurge in radical and supraradical lymphadenectomy.

In 1968, Harvey and Auchincloss[4] described the lymph node metastatic rate in patients who survived at least 5 years after surgery for cancers of breast, colon, rectum, and stomach. They demonstrated that less than 3% of long-term survivors had more than 5 lymph node metastases and 94% of all survivors had negative or 3 or fewer regional lymph node metastases. This illustrates how little there is to be gained by removing 20 lymph nodes in contrast with 10, for instance, in an attempt to improve survival of the few patients that had extensive lymph node metastases, since one is only removing the speedometer. We recently have completed a contemporary update of the Harvey and Auchincloss article by looking at 10-year disease-free survivors in breast, colorectal, gastric, and lung cancers (**Table 3**). We confirmed their finding that seldom did survivors harbor more than 3 regional lymph node metastases from their original cancer, again emphasizing how little can be gained by radical lymphadenectomy in an attempt to harvest still more speedometers. Radical lymphadenectomy is based on an outdated halstedian model that assumes lymph nodes are Millipore filters that prevent further metastases in a lymphatic dominant model of cancer cell spread, a mechanical, not a biological, model. Teleologically, lymph nodes developed as foreign antigen recognition stations, not Millipore filters, to produce humoral antibodies. Our goals in surgical oncology should be not expensive and fruitless radical harvesting of indicator lymph nodes, but modest lymphatic resections, or even "sentinel" node biopsies for prognostic purposes, with development of adjuvant therapies to improve outcome, which is governed almost exclusively by distant systemic metastatic disease to vital organs. Programs of earlier detection to reduce the number of patients with lymph node metastases will be more beneficial than radical node resections, as amply demonstrated by the experience in Japan with gastric cancer.

Lymph node metastases themselves do not cause patient death, with rare exceptions, again reinforcing their indicator role. Recent experimental work by Phina Brodt at McGill University, Montreal, Quebec,[5] shows that there are "lymph node avid" metastatic cells that adhere and grow only in lymphatic tissue, thus mimicking other organ-specific metastatic systems described by Fidler.[6] In Fidler's models, cells harvested from liver metastases in animals with widespread metastases and reinjected intravenously in succeeding generations of the same animal cause only liver metastases. Such organ specificity of circulating cancer cells can be shown with lung and bone metastases also. Lymph node metastases certainly are further examples of metastatic organ specificity. That is why there are some long-term survivors who had a few lymph node metastases: such patients had only lymph node specific metastatic cells that could not lodge or grow elsewhere. When extensive node metastases occur they undoubtedly are more likely to be associated with other organ metastatic cells. Brodt's work provides the experimental model for the indicator, but not governor, function of lymph node metastases.

CANCERS ARISING IN THE SAME ORGAN MAY BE BIOLOGICALLY DISTINCTIVE

Another basic surgical oncology principle emphasizes that cancers appearing in the same organ does not mean they are biologically similar, nor should they be treated by a similar operation. No organ site so dramatically demon-

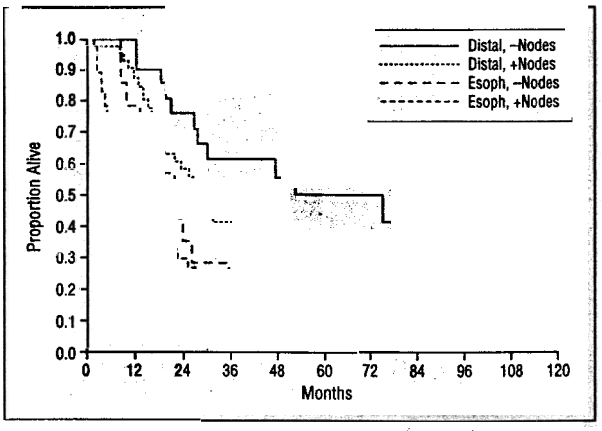

Figure 2. *Kaplan-Meier survival curves comparing nodal status and location of gastric cancers for patients treated curatively with focal-type cancer. Distal indicates distal gastrectomy; Esoph, esophagogastrectomy; plus sign, positive; minus sign, negative (P=.0001 using the Cox-Mantel test). Reprinted with permission from the* Archives of Surgery.[7] *Copyright 1994 American Medical Association.*

strates this as differentiated carcinoma of the thyroid. The vast majority of patients with thyroid cancer fit into a clinically defined low-risk group where disease-specific mortality is only 1% at 20 years. Even though the disease appears to be the same clinically and under the microscope, there is no similarity in behavior and outcome; there should be no similarity in the treatment program addressing low-risk in contrast with high-risk patients. In low-risk patients based on mulitfactoral risk assignment systems defined by acronyms such as AMES, AGES, DAMES, GAMES, or MACIS, dramatically different biological aspects of the disease, indeed, quite different diseases, are displayed. For instance, in low-risk patients, size is not related to outcome, extra glandular extension does not cause a poor outcome, lymph node metastases are common, and even distant metastases have a better than 50% long-term disease-free survival after treatment with radioactive iodine. In contrast, older high-risk patients have high long-term mortality rates directly related to size and extension of the local primary tumor growth. Lymph node metastases are uncommon, and distant metastases are almost uniformly fatal. It is largely unnecessary to use radioactive iodine as an adjuvant in low-risk young patients in the 1990s because of the early presentation of disease and the lack of risk of death. Many academic endocrine surgeons who operate exclusively on thyroid and parathyroid glands advocate total thyroidectomy for all patients largely because of efficiency in the later adjuvant use of radioactive iodine. Such a generality from the practice of a group of superspecialists is inappropriate for the general surgeon, since lesser operations are just as successful for cure and avoid operative complications in low-risk patients. The vast majority of patients with thyroid cancer do not require radioactive iodine. Total thyroidectomy may rationally be utilized in high-risk patients, since all of them will probably receive radioactive iodine in an attempt, perhaps futile, to improve their poor prognosis.

Other cancers illustrate biologically distinctive diseases despite similar organ origin. Proximal gastric cancers are totally different from distal gastric cancers, with a different epidemiology and etiology, and a markedly different outcome following surgery. Proximal gastric cancer has such a poor prognosis that the additional presence of lymph node metastases does not worsen outcome, and therefore extensive lymphadenectomy is irrelevant[7] (**Figure 2**). In contrast, distal gastric cancer has a progressively declining success from resection based on increasing numbers of lymph node metastases, with extremely poor survival only seen in patients with more than 3 lymph node metastases; thus modest lymphadenectomy can be justified. Linitis plastica is another separate clinical disease arising in the stomach and is virtually incurable from inception. Resection, when possible, usually requires total gastrectomy, since the entire stomach is involved. No formal resection of lymph nodes is required, since they are irrelevant to outcome.

In the breast there are striking differences in biological disease behavior comparing inflammatory and some advanced primary cancers with the usual invasive ductal carcinomas. Fox[8] demonstrated their separate exponential survival curves. One population of patients die at the rate of 25% of the surviving fraction per year, while most die at the rate of 2.5% of the surviving fraction per year. Induction chemotherapy for inflammatory and advanced primary breast cancer should be the current treatment of choice combined with radiation therapy, and it seems to have made a significant impact on this aggressive disease variant. Such patients often, if not routinely, undergo mastectomy even when the primary disease is well controlled by induction chemotherapy, local excision, and radiation therapy. Fear of local recurrence as a reason for the mastectomy is misplaced, since local recurrence of disease does not cause poor survival but is a marker for it—a surgical oncology principle—and death from disease is entirely related to distant metastases, not local tumor growth. A mastectomy should be reserved exclusively for the inability to initially control, or for recurrence of, the primary cancer.

Small tubular or colloid carcinomas of the breast are now usually treated by excision, radiation therapy, and axillary dissection, although sophisticated analysis has clearly shown that these low-grade lesions, especially when detected by mammography, have virtually no risk of nodal metastases, local recurrence, or death. They can be treated by local excision only, avoiding axillary dissection or radiation therapy. This is in sharp contrast with larger invasive ductal carcinomas of poor histologic grade that have significant risk of local recurrence and distant metastases and require more aggressive treatment. Mastectomy, or axillary dissection, or radiation therapy for mammographically discovered tubular carcinomas less than 1 cm in diameter displays adherence to doctrine rather than common sense in managing a unique, separate cancer of the breast increasingly detected by screening.

ADJUVANTS TO SURGICAL RESECTION BOTH SYSTEMIC AND LOCAL, ACHIEVE ONLY PROPORTIONAL REDUCTIONS IN RECURRENCE

Understanding the proportionality of improvement by use of adjuvant treatment following surgical resections is critical for rational decision making. Every research trial involving adjuvant systemic therapy in breast and colorec-

Table 4. Breast Cancer: Hypothetical Cost-Benefit Analysis of Radiation Therapy After Breast Conservation*

Initial Treatment	Hypothetical Groups	No. of Patients With Intact Breast at 10 Years		Radiation Cost ($15 000 for 60 Gy)
No radiotherapy	In 100 patients			
	70% No further breast surgery	70		
	30% Surgery for			
	Local recurrence (15%)		90	
	New primary breast cancer (15%)			
	Two thirds have breast conservation and radiotherapy	20		$300 000 (20×$15 000)
Radiotherapy	In 100 patients			$1 500 000 (100×$15 000)
	85% No further breast surgery	85		
	15% Surgery for			
	Local recurrence (5%)		90	
	New primary breast cancer (10%)			
	One third have breast conservation	5		

Difference in cost= $1 200 000 without a difference in survival

Assume 1 cm or more invasive breast cancer in patients older than 55 years with adequate excision equal to 1-cm margins.

tal cancer has demonstrated that reduction in recurrence by the use of chemotherapy is a constant fraction. Thus, a 25% reduction decreases a recurrence rate of 40% by 10% or a recurrence rate of 20% by 5% or a recurrence rate of 10% by 2.5%. This proportionality is not recognized nor reemphasized enough to patients or physicians. Thus, systemic adjuvant chemotherapy or hormonal therapy in breast cancer were basically designed to improve somewhat the outcome of patients with a poor prognosis. They were never designed, nor should they be employed, to marginally improve the good prognosis in patients with early disease. Because of the enthusiasm about what has been achieved in adjuvant therapy of breast cancer, larger and larger numbers of patients who have a relatively good prognosis are being swept into adjuvant treatment programs. Encountering patients in my office who have returned from a consultation routinely elicits no comprehension about the proportionality of treatment effect. Most frequently, patients report they are told, "I think you would do best with adjuvant treatment." Seldom is the complicated but critical message given that if the patient only has a 10% or 15% chance of dying of disease, they may only gain 3 to 4 percentage points at a maximum by the use of adjuvant chemotherapy. When only a 4% absolute gain occurs from a 25% proportional reduction in recurrence or mortality in a patient with a 15% risk of recurrence, the emphasis should include that 96% of patients who get the chemotherapy do not benefit. If the proportional gains are less in magnitude, as with hormonal therapy, the absolute gain is commensurately less. Older patients with a 25% recurrence risk may only gain 3% absolute improvement, while 97% of such patients receive no benefit, yet tamoxifen citrate is routinely ordered at the cost of $1000 per year for 5 years. For 100 patients, that cost is $500 000 and if only 3 patients benefit, the cost of each beneficial result is $167 000, far higher than any sustainable cost-gain equation. This is in sharp contrast with cardiac medications for heart disease for instance. In the utilization of modern drugs for cardiac disease, the vast majority of patients get some benefit and only a few get toxic reactions. With cancer chemotherapy, everybody gets toxicity but only a few people benefit. If we truly analyze the cost-benefit ratio of giving patients costly adjuvant chemotherapy for the sake of a few patients benefitting by either a postponement of appearance of metastatic disease, or a marginal gain in absolute curability, we could not justify such treatment in a large proportion of treated patients with a good prognosis. Do not misunderstand: utilizing adjuvant treatments in poor-prognosis patients when proportional gains may translate into absolute gains of 15% or 20% may well be properly encouraged. I only urge that patients and doctors truly understand the balances involved.

The same proportionality of results also occurs in the use of local adjuvant radiotherapy, which has no influence on survival. Thus, a reduction of local recurrence from 30% to 5% is certainly justifiable in high-risk cancers, but a reduction of local recurrence from 12% to 2% cannot be economically justified, since it can be demonstrated that the same number of patients at the end of 10 years will be alive and have an intact breast (**Table 4**). When the charges for a course of adjuvant radiotherapy for breast cancer range from $15 000 to $25 000, the cost per breast saved may total $500 000; we need to rethink routine use of radiotherapy in small breast cancers.

WILL ROGERS IS ALIVE AND WELL IN THE LAND OF SURGICAL ONCOLOGY

When the Okies moved to California, the IQ of both states went up.

More radical local organ or regional lymphatic removal frequently achieve their illusory improved effect because of stage shifting. If you harvest 20 nodes rather than 10 you may either find an unexpected positive node or more numerous positive nodes—subtle examples of stage shifting. Furthermore, if you set your pathologist to work to dissect more rigorously the lymphatic specimen, or use extra sections or histochemical staining of lymph nodes or a single sentinel node, you will find more positive nodes, usually micrometastases—another great example of stage

shifting. The current enthusiasm for polymerase chain reaction to expand the capacity to detect minuscule lymph node metastases will throw our entire breast cancer and other cancer staging systems into the wastebasket through stage shifting. The Okies have truly moved to California with the IQ or survival of both states or stages improving! Beware of stage shifting when reading surgical oncology literature. I recently reviewed an article in which the authors defined a curative operation as having a 10-cm negative gastric margin and then proudly pointed out how high their cure rate was! And the editors printed it.

CURE BY RESECTION OF METASTASES IS PATTERN DEPENDENT, NOT TIME DEPENDENT

The biological situation in metastatic colorectal carcinoma to the liver is completely unique. No other human cancer that metastasizes to the liver permits liver resections with cure except anecdotally. Why this unique pattern occurs is unknown except as an empirical description, but emphasizes the controlling influence of pattern, not time, in outcome.

Essentially no patient with metastatic colorectal cancer to the liver who has more than 3 separate metastases, with or without satellite nodules, can be cured by surgical resection. Furthermore, patients with colorectal cancer metastases in more than a single organ at presentation are incurable, with only anecdotal exceptions. Following resection and survival of a hepatic metastasis, however, a curative resection of a later solitary pulmonary metastasis is uncommon, but reported, again emphasizing the control of outcome by pattern of disease presentation. Long-term survival is similar in large or small liver metastases and in synchronous or metachronous metastases. Early recognition of inappropriate biological situations (many metastatic nodules) does not increase survival, and delayed resection of appropriate biological situations (1 or 2 metastases) does not impair survival. Every attempt to speed up the temporal sequence of discovering metastatic lesions in human solid tumors will be doomed to failure, since pattern rather than earliness of detection is the governor of outcome.

Thus, routine carcinoembryonic antigen (CEA) monitoring after resection of colorectal cancer does not improve the outcome of patients with liver metastases or other metastatic disease in randomized trials. Recent enthusiasm for radioimmunoguided surgery (RIGS) by use of labeled CEA antibodies in colorectal cancer to find metastatic disease earlier, or in more organs simultaneously, is doomed to failure since it violates basic principles of surgical oncology. Similar findings occur in isolated metastatic pulmonary lesions from osteogenic or soft-part sarcomas or colorectal cancers. Routine surveillance for distant metastases in melanoma, breast cancer, lung cancer, and other cancers is essentially useless. Talking to patients in follow-up to discover symptoms that can be palliated is essential, however.

It is conceptually difficult for patients and most physicians to understand that the principle of early detection, which is so pertinent in primary cancers, is so totally irrelevant in metastatic cancers, since it is a counter-intuitive, but nevertheless real, phenomenon.

Our goals in the surgery of hepatic metastases in colorectal cancer should be to develop rigorous and restrictive patient selection policies, since only 20% of patients are disease free at 5 years after curative hepatic resection. Results following hepatic resections reemphasize that biology is King, selection is Queen, and the princely over-enthusiastic technical exercise of hepatic resection cannot overcome those first 2 prominent rulers of results in surgical oncology.

IT IS IMPOSSIBLE TO PALLIATE ASYMPTOMATIC PATIENTS

Increasingly I encounter patients who are urged to have chemotherapy for asymptomatic metastatic disease. Routine use of chemotherapy in patients with metastatic disease frequently has more to do with the philosophy of the treating physician than the needs of the patient. Because of unreasonable expectations and a failure to understand the risk-gain benefits, many patients feel that they have to undergo the significant toxic reactions from chemotherapy while they are feeling perfectly well. They are pressured to partake of therapy when asymptomatic. I know of no more pernicious misunderstanding of basic principles and misapplication of technology. The only palliation in such situations that can be achieved is a psychological one, in which case we should use only nontoxic therapy and support systems.

Most Americans are activist and may feel uncomfortable or even guilty if they do not embark on therapy in such situations. The concept of "Don't just do something, stand there" is unsettling. However, I personally feel uncomfortable taking incurable patients who may have limited disease-free or symptom-free life remaining and making them ill with treatment when the outcome is not changed. Many physicians make such patients afraid not to take therapy, while I find myself frequently encouraging them to enjoy their symptom-free state for as long as possible, and utilize therapy only when they develop symptoms. I describe symptoms as an indication that their body's natural defense mechanisms are beginning to call for help. It is difficult, but essential, to tell patients that we have no magic solutions. Since symptoms should govern therapy, doing technical tests to discover asymptomatic metastases is meddlesome. Do not look for what you do not want to find!

It is certainly justifiable to use even toxic therapy to attempt relief of significant symptoms, since at the end of the treatment program there is a chance that the patient will actually feel better if response is achieved. Unfortunately, in many of these situations the patients are subjected to continuous chemotherapy over many months, and both physician and patient are afraid to stop, thus continuing to accumulate the toxicity and morbidity of the drug rather than enjoying the benefits of a newly achieved asymptomatic state.

THE SOLUTION OF MANY OF OUR SURGICAL ONCOLOGY PROBLEMS ARE ECONOMIC, POLITICAL, AND REGULATORY

Our major therapeutic efforts in cancer management today frequently involve high technology and complicated, morbid, and expensive treatments after the ap-

pearance of the disease. We fail to emphasize enough the major long-term social, and probably economic, benefits that might accrue from screening our population for melanoma, breast, colorectal, and possibly prostate cancer as a method of preventing death from disease.

For instance, we should embark on a national public education campaign on prime time television for early recognition of melanoma. Melanoma is 95% recognizable by lay people following brief visual education about pigmented lesions, and as a result major potential gains in outcome in melanoma would certainly accrue by widespread publicity on prime time television. While melanoma detected in this country today is generally relatively early with an overall 88% survival rate, enormous further gains could be achieved by such simple public educational messages. This is an economic problem related to the commercial basis of our television industry and their unwillingness to devote prime time to anything but income production. Considering the extraordinarily complicated and costly efforts to develop adjuvant therapy for poor-prognosis melanoma resulting from delayed diagnosis, money or time spent on early detection would be highly cost-effective. Unfortunately, academic recognition, promotion, and income do not accrue as easily to physicians who develop or apply public health advances as to those who focus on high-technology therapy, so professional incentives should change also.

Dramatic improvements in the presentation of breast cancer have been clearly related to mammographic screening of women, yet we still struggle to get appropriate screening of women between the ages of 40 and 75 years. It can be predicted that if yearly mammographic screening becomes nearly universal, the median maximum diameter of all invasive breast cancer in the United States will decrease to only 1 cm within a decade, and even less within 2 decades (**Figure 3**).[9] Clearly such a possibility needs to be emphasized by television messages, public education by every means, and professional education so it becomes a routine quality of care measurement. The previously unchanged age-adjusted mortality rate from breast cancer since the 1930s for the first time is now trending downward as a result of screening by mammography. We are achieving these gains in survival by screenings for breast cancer which discover the preliminary noninvasive cancers and detect such small invasive cancers that the clonal subselection of poorly differentiated forms seen in larger cancers is preempted. Here again the issue is economic and regulatory by mandating insurance coverage and licensing medical care delivery systems rather than technical therapeutics.

In the political and regulatory realm there is no more glaring example of the failure of our society to come to grips with a major cancer cause than the perversion of our political process by the tobacco industry. While more than 80% of the American public, including smokers, believes that tobacco control is important and more than 90% agree with the central tenets of the proposed Federal Drug Administration regulations, we have been unable in either State Houses or the national Congress to achieve anything resembling a reasonable control of the lethal addictive drug nicotine. Such political paralysis is directly attributable to the control of many legislators and politicians by the tobacco industry as a result of their enormous financial sponsorship. How we can tolerate this perversion of our political process by the greed and aggressiveness of an industry marketing a known lethal and addicting drug defies any definition of a real democratic process. Campaign finance reform is desperately needed. The fact that tobacco control has become a hot presidential political issue is a sign that the public is sick of the tobacco industry manipulation of our politicians and our media.

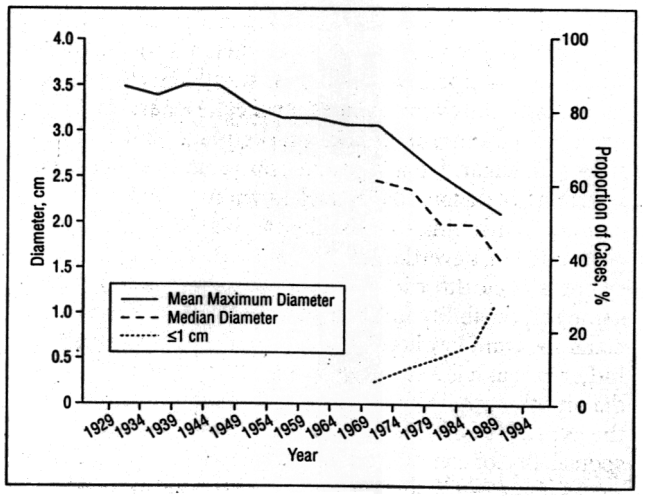

Figure 3. *Mean and median (when calculated) maximum diameters in centimeters and proportion of cases measuring 1 cm or less in maximum diameter (T1a and T1b) in all invasive breast cancers of stages I, II, and III at the New England Deaconess Hospital, Boston, Mass, over time. Reprinted with permission from the* Archives of Surgery.[9] *Copyright 1996 American Medical Association.*

The American Cancer Society in the near future will challenge itself and the American public to achieve a 50% reduction in cancer mortality by the year 2013, the Cancer Society's 100th anniversary. This achievement is possible by application of current knowledge about cancer control. To reach this practical and realistic goal, however, Americans must take several steps: First, we must control the tobacco industry and impose sharp increases in excise taxes at state and federal levels, which has a proven ability to dramatically reduce consumption of tobacco, particularly among children. Second, we must encourage and pay for mammographic screening of every woman between 40 and 75 years of age and utilize screening for colorectal carcinoma, since it has been demonstrated that stool testing for blood can lower death rates at a manageable cost by early detection of polyps and cancer. We must also discover the potential benefits, if any, of screening for prostate cancer. Third, cancer prevention can occur by dietary modification, as Seventh Day Adventists[10] and Mormons[11] demonstrate. Recent data has shown that upper class white Americans have adopted a more healthy dietary lifestyle with lower fat intake and altered eating patterns. The poor, both black and white, 30 years ago ate a relatively healthy grain, legume, and nonfat diet because of economic stringency, but now are eating an unhealthy diet high in fat, calories, and sugar, low in fiber, and based heavily on junk food and advertised food.

The fact that more educated Americans have absorbed the lessons of dietary modification reemphasizes public education as a major aspect in cancer control and also demonstrates the need to more rationally regulate our American diet. Recent Food and Drug Administration man-

dates for extensive nutrition labeling has been useful but nevertheless directed largely towards better-educated consumers. More intrusive regulations should be considered to deal with the overconsumption of calories and fat in an unregulated entrepreneurial marketplace that emphasizes salt, sugar, fat, and promotion of new artificial flavors and not dietary staples such as grains, fruits, and vegetables. While this sounds like the laments of an aged curmudgeon, nevertheless, the concern about the expensiveness of health care requires that Americans assume some responsibility for their part of the equation. Politicians are again key here, and are too often the captives of industry that has an income, not health, agenda. The media and the public have too often blamed physicians for the expense of our medical system without accepting responsibility for controlling tobacco, diet, and exercise themselves. This surely would be helped by governmental intrusion into the marketplace, a much maligned concept in the current Wild West political scene. Prevention rather than after-the-fact high technology, the "halfway technology" of Lewis Thomas,[12] is the appropriate way to deal with a too-costly medical care system.

THE ART OF SURGICAL ONCOLOGY IS TO APPLY BASIC PRINCIPLES FLEXIBLY TO THE INDIVIDUAL PATIENT

My ruminations are meant to illustrate that the art of a surgical practice is critical. Mere technical adroitness, while one essential part of surgical oncology, is too shallow to satisfy a career that should have both depth and breadth. The art of our profession is judgment, not doctrine. Appreciation of the variability of patients and diseases so that the punishment of the cancer treatment fits the crime of the aggressiveness of the cancer itself should be our goal.

Public attitudes in recent years increasingly express an anti-science, anti-intellectual, and antirational bias with increasing belief in the supernatural, magic, and even angels! A recent poll in New Hampshire indicated that 14% of New Hampshire residents thought they had seen a ghost, 9% reported having seen a UFO, and 7% reported having seen an angel. Only 27% of New Hampshire residents said they did not believe in angels! Republicans were slightly more likely to believe they had seen an angel, while Democrats were slightly more likely to believe they had seen a UFO, a variation that surely has some profound social and political significance that so far has escaped me.

We surgeons, as scientists and artists, have the obligation to refer to basic rational principles in treating cancer patients, and not allow magical thinking to control patient decisions. In physicians, the lack of awareness of overriding principles and a personal philosophy that generally espouses activism may be at variance with patients' real needs, while in patients a lack of an overall philosophy of life or ability to place medical and surgical care and its risks and benefits in the context of a rational life direction is frequent.

Patients with unrealistic expectations are exemplified by the saying, "American patients are the only ones in the world that believe death is optional." They may accept all sorts of expensive high-technology but low-yield therapy, expecting magical results. On the other hand, there is a conflicting trend in our society exemplified by the interest and publicity surrounding Dr Jack Kervorkian. I was astonished at my 40th college reunion when the medical topic that overwhelmingly elicited the most interest in my 60-year-old classmates was that of physician-assisted suicide, or escape from the travails of illness. It made me recall that homeopathy, the practice of dilution of drugs to eliminate toxicity, was a reaction in the early 1800s to the excesses of drugs, purging, and bleeding that were the standards of medical practice of that day. The emphasis on alternative therapy may be a current parallel to homeopathy and a warning that some of the public increasingly views our scientific medicine and protracted cancer treatment as being too aggressive, too technical, and too much emphasizing marginal gains at major costs while ignoring more humane treatment. More than 50% of American cancer patients are utilizing alternative treatments while receiving conventional treatments from physicians. While some of this is magical thinking, it should be a cautionary note for us, and requires study, not disparagement.

I do hope that my talk will be viewed as less the muttering of a misanthrope than the expression of an attitude best summed up by the marvelous final lines of Robert Frost in his poem "The Lesson for Today" that ends:

> *were an epitaph to be my story,*
> *I had a short one ready for my own.*
> *I would have written of me on my stone*
> *I had a lover's quarrel with the world.*

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