Supportive and Palliative Radiation Therapy

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The total care of the cancer patient undergoing radiation therapy must include emotional support, prevention and correction of tissue dysfunction, augmentation of nutrition, metabolic and electrolyte regulation, rehabilitation and vocational support. In addition, the physician should be concerned not only with survival, but also with the quality of life. Proper palliation can help the patient live comfortably and productively during the last phase of his life.

SUPPORTIVE CARE

Emotional Assistance
Cancer causes more misunderstanding and fear than any other disease. And, of all the modalities used to treat cancer, radiation therapy induces the most anxiety and confusion. Effective doctor-patient communication can relieve much of the emotional stress of the patient and his family.

Many fears affect a patient undergoing irradiation: the fear of death and dying, of being burned, disfigured and unable to perform normal bodily functions, the anticipation of pain, sterility and loss of sexual function. The physician can recognize and understand these fears only by careful listening. Often, however, the patient is unable to describe his state of discomfort, or the reason for it. When the patient has completely internalized his emotions, severe physiologic symptoms can arise.

Fear creates major systemic responses—drying of the mouth, dilation of the pupils, tremor to the hand, vomiting and severe palpitations—which are more difficult to relieve or reverse than anxiety. Therefore, attention and therapy must be immediately directed to alleviating low-level chronic anxiety.

Experimental studies of human anxiety have documented physiologic changes, most often in the cardiovascular system (pulse and blood pressure)\(^1\,\%^2\) and gastrointestinal tract (colic and diarrhea). Just as common, but less severe, are ocular (pupillary) and dermal responses (temperature and moisture). These physiological changes must be brought to the patient’s attention; often, anxiety can be relieved by open discussion. If unmanaged, it can produce symptomatology severe enough to interrupt radiation treatment.

Central to all anxiety is the factor of the unknown. For example, patients will exhibit a marked decrease in blood pressure after being told that “there will be no pain.” At New York Medical College, we are presently evaluating

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whether a patient whose blood pressure responds to information will better tolerate the treatment procedure, without interruption and without more intense psychological intervention.

Tissue Support
An infiltrating or expanding cancer damages certain tissues, causing dysfunction, which may be accentuated by the therapeutic modality employed. The extent of tissue dysfunction depends on the type of tissue, how vital it is to the organism, the extent of its damage, the ability of the tissue to restore itself, and the existence of an inherent compensatory substitute function. Supportive therapy, including construction of prostheses and plastic surgery, during and immediately after treatment and/or long-term rehabilitation, can significantly reduce tissue dysfunction.

Skin
In the first two decades of radiotherapy, employing energies below 150 KV, skin changes were so consistent that they were used to measure the dose of radiation delivered: the so-called "skin erythema dose." Becquerel first noticed radiation erythema, as early as 1897, while carrying a tube of radium in his vest pocket. Soon after, Pierre Curie deliberately induced a similar reaction on his arm in order to study the radiation effects more closely. With the advent of supervoltage therapy and its inherent skin sparing effect, the site irradiated became an important factor affecting skin damage. For example, the skin areas of the perineum, buttock and retromammary sulcus have relatively low radiation tolerance. This is attributable to the excessive moisture and warmth in these areas, making them a fertile media for bacterial infections. The degree of radiation damage to the skin varies from erythema and edema to a moist desquamation that leaves a raw surface, resembling a second-degree burn. Severe damage causes reactions similar to a third-degree burn, with destruction of both dermis and epidermis.

The principles of treatment for skin reactions are the same as those for skin burns. Erythematous skin should be kept dry and well aerated. A drying agent like baby powder or corn starch may lessen itching, which can be very bothersome. Mild antiseptics, such as Gentian Violet, or dilute solutions of hydrogen peroxide are also beneficial. For moist desquamation, an antibiotic ointment, in addition to a preparation containing vitamins A and D, speed healing. Topical applications of a steroid cream relieve some of the more severe symptoms of itching and pain.

Mucous Membrane
Radiation reactions affecting the mucous membranes of the digestive and upper respiratory tracts require a major portion of the supportive therapy necessary in radiation oncology. The tolerance of the mucous membranes varies, depending on the site. Radiation to the intestinal mucosa, which is very sensitive to radiation and chemotherapy, can result in mild diarrhea, ulceration and even hemorrhage. Similar therapy delivered to the buccal mucosa or vocal cord causes comparatively less damage.

In the oral mucosa, initial radiation changes include congestion and loss of the normal, glistening smoothness of the membrane. There may also be a change or loss of taste, but the symptoms are mild. Further radiation causes mucositis, followed by the formation of a thin whitish film, often called a "false membrane." Mucositis is associated with various degrees of soreness and inability to swallow. The patient must be warned to avoid irritants, like smoking, spicy or hot foods and alcoholic beverages. The mucous membrane should be kept clean by rinsing with small amounts of salt or baking soda. A mixture of aspirin and glycerin (aspirin mucilage), may help
the patient to swallow. Xylocaine prior to meals can ameliorate more advanced inflammatory reactions. Secondary infections with mycotic organisms (mocknia) are not infrequent, and often mimic severe mucositis. These infections require topical application of Gentian Violet or an antifungal agent, such as nystatin. Special attention must be paid to tissues necessary for deglutition, especially when the treatment fields encompass the salivary glands.

Motor dysfunction is also a sequela of mucous membrane damage. Damage to the motile parts of the digestive tract, such as the esophagus or intestines, can cause colic or dysphagia. Diarrhea is a very common symptom if large fields are irradiated or if the colon or rectum is significantly affected. Continued damage to the esophageal membrane can result in severe dysphagia and ananition or, in the lower intestinal tract, uncontrolled bleeding.

Diarrhea usually responds to simple measures, such as Kapectate or to opiates and opiate-like agents, for example, codeine and diphenoxylate (Lomotil). On occasion, radiotherapy must be suspended for a number of days until symptoms subside. Recently, salicylates in a fully buffered form were shown to benefit certain patients with radiation-induced diarrhea, abdominal pain and nausea, who did not respond to the above measures. The therapeutic action is believed to be related to the inhibition of prostaglandin biosynthesis. In a series from the Royal Marsden Hospital, England, 12 of 15 patients resistant to conventional forms of therapy improved with this type of treatment. It was suggested that other radiation-induced side-effects, such as pain, skin irritation and fever, can also be relieved by acetylsalicylate.

Nutritional Support
To avoid severe nutritional problems, the long-term symptoms attributable to intestinal damage may require continued post-treatment support. Dietary restrictions can relieve the symptoms of chronic radiation enteritis. For example, a diet free of gluten, protein and lactose overcomes and avoids the absorptive problems resulting from atrophy of the intestinal villi, with a marked improvement in nutritional status. This is particularly important in the growing child who receives combinations of chemotherapy and radiation to large abdominopelvic fields.

Diet is equally important in the support and management of patients treated for head and neck cancer; a dietitian should work closely with the physician and have direct access to the patient. Here again, the diet should assure a high level of nutrition, while eliminating those foods that irritate the mucous membrane or are too thick and dry for damaged salivary glands. This may preclude the need for nasogastric feeding when the patient is unable to swallow.

Hyperalimentation
Intravenous hyperalimentation has been of enormous benefit in maintaining electrolyte balance and nutrition in a patient with obstructive lesions of the esophagus, further compromised by radiation edema or severe radiation esophagitis. Treatment consists of an infusion into the subclavian vein of a high caloric, hyperosmolar solution containing 20 percent glucose and six gm. nitrogen, as well as essential vitamins and minerals. Every 24 hours, 2000 ml. of fluid delivers 2000 calories, preventing significant weight loss in these patients. If the percent of protein hydrolysate is reduced from six to 3.5 percent, the infusion can be kept in place for several weeks without the complications of thrombophlebitis, sepsis and osmotic diuresis that are associated with hypertonic solutions.

Dental Care
Radiation affects the serous acini of the
salivary glands, leading to a marked reduction in the quantity of secretions and a concomitant increase in their acidity and viscosity. Normal saliva prevents dental caries by buffering and diluting those acids produced by food fermentations and prevents plaque formation by cleansing the teeth. Thick saliva cannot perform these functions.

Direct radiation damage of the teeth primarily involves the periodontal membrane with resorption of alveolar bone and resultant loosening of the teeth. Severely decayed teeth must be extracted prior to treatment to preclude future surgical manipulation of irradiated tissues and its associated poor healing and infection. Healthy teeth directly in the line of radiation should not be removed. Teeth left in place have shown remarkable endurance when supported by a rigorous maintenance program of oral hygiene. Cleaning the teeth, with removal of tartar and plaque, and fluoride applications are the prime preventatives of radiation caries. The teeth are bathed topically in a fluoride carrier into which a viscous fluoride solution has been poured. The appliance is then fitted over the teeth and kept in place for five to 10 minutes a day. Postirradiation dental sensitivity can also be helped by a similar fluoride application. Dental prostheses to move healthy tissue out of the irradiated field should fit exactly. Non-irritating materials must be used in making impressions. The mucous membrane during or following irradiation is more prone to laceration and signs of pressure necrosis.

Support of Hematopoietic Functions
Regional, extended and total nodal irradiation in the treatment of lymphomas has, in certain instances, included more than 70 percent of viable marrow and the entire marrow system, when total body irradiation has been employed. The reversibility of damage to erythropoietic, granulopoietic and thrombopoietic tissues depends on the amount of radiation delivered and the amount of marrow affected. Changes in the peripheral blood elements relate not only to marrow irradiation but also to loss through hemorrhage and injury to vessel walls.

Therapy to enhance marrow recovery has included the use of testosterone (delatestryl) and nandrolone phenpropionate (Durabolin). Testosterone stimulates erythropoiesis, but its mechanism of action is still unknown. It has also been shown to affect granulopoiesis and thrombopoiesis.

A decreased peripheral cell count is easily corrected by transfusion that includes platelets, but marked leukopenia may require prophylactic antibiotic therapy and the use of reverse isolation or the Life Island. Gram negative organisms are a major cause of infection in patients with impaired host defense mechanisms. To protect these patients, reverse isolation has proven to be very valuable. Rigid isolation techniques, however, are difficult to enforce and multidrug antibiotic combinations have often been necessary to prevent and treat infection. For this reason, interest has increased in the use of a protective environment unit, in which all items are pre-sterilized and the air circulates through high efficiency filters. Laminar air flow prevents concentration in the air of shedded organisms.

Metabolic Regulation
Bone destruction from tumor growth, particularly in patients with diffuse osseous metastases, can cause hypercalcemia with resorption of skeletal calcium exceeding renal clearance. The definitive treatment of this condition is successful antitumor therapy. Since the effects of radiation on the tumor may be somewhat delayed, other measures are necessary to combat high serum calcium. Corticosteroids are most effective in the treatment of hypercalcemia associated with breast cancer, myeloma and
lymphoma. In addition to their calcucretic effect, steroids are thought to retard tumor growth. Intravenous or oral phosphates, chelating agents, dialysis and the cytotoxic agent, mithramycin, have also been used to correct serum calcium levels.

Rehabilitation
Total care includes not only the diagnosis and treatment of the cancer but also the complete rehabilitation of the patient. Physical reconditioning to restore full strength is essential for those patients who underwent radiation and surgery for cancers affecting, or adjacent to, the extremities, such as lymphadenectomy. The physician must also be aware of the tolerance of treated tissues for preprosthetic conditioning, laryngeal reconstruction, grafting or maxillofacial reconstruction. In addition, the social service department of the hospital can be of immeasurable assistance by providing civic and private agency support, and by finding suitable institutions for convalescent care and vocational training.

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PALLIATION THERAPY

A large proportion of patients with advanced disease are not candidates for extensive curative treatment. Radical treatment is ill-advised for a patient with reduced life expectancy. However, with proper palliation, these patients can live comfortably and productively during the last phase of life. Adverse treatment reactions, produced in an attempt to relieve the severe, distressing symptoms of advanced disease, must be avoided. With present large field, high-dose techniques and the concomitant use of cytotoxic agents, palliative radiation must be meticulously planned and executed.

Pain
The etiology of the pain often dictates the success of radiotherapy and the extent of palliation. For example, radiation is very effective in relieving bone pain due to metastases from breast or bronchogenic carcinoma. It is only moderately successful for pain caused by stretching of the organ capsule, as in cancer of the parotid gland or liver. However, if the tumor invades nerves or muscles that perform mechanical actions, painful dysfunction occurs, as in the trismus caused by invasion of the pterygoid fossa and the dysphagia resulting from invasion of parapharyngeal tissues. Here, the relief afforded by radiation therapy has met with measured success and is related to the degree of normal tissue destroyed by the tumor. Pain caused by tumor invasion or encapsulation of nervous tissue, for example, invasion of the brachial plexus, is usually only partially relieved by treatment.

Bleeding
Radiation readily relieves bleeding and is considered a highly successful styptic agent. The dosage necessary to achieve palliation depends in part on the type of tumor growth and its degree of invasion. Doses ranging from 400 rads daily for three days directed to an exophytic, fungating cervical carcinoma may be as successful as 3000 rads delivered in two or three weeks to an ulcerated infiltrating tumor of the bladder.

Pressure Effects on Vital Organs
Pressure on vital structures, such as the superior vena cava, are also relieved by irradiation. Major and minor bronchi obstructed by tumor with resultant distal atelectasis and pneumonia often respond to treatment, facilitating drainage of secretions and improving pulmonary ventilation.

Restraint of Tumor Growth
At times, palliation is necessary to promote the patient’s sense of well-being. For example, necrotic tissue in an en-
larging tumor often becomes infected, producing a foul odor. Radiation of these lesions alleviates local suppuration, enhances the patient’s self-esteem and improves nursing care.

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ANNOUNCEMENT

National Bladder Cancer Conference

The National Bladder Cancer Project, a grant-supported research program of the Division of Cancer Research Resources and Centers, National Cancer Institute, is planning to hold an open conference on the etiology, assessment and management of bladder cancer at Miami Beach, Florida, on November 28 through December 1, 1976. For more information, write to the National Bladder Cancer Project, St. Vincent Hospital, Worcester, Massachusetts, 01610; or call (617) 798-6295 and give your name and address.