

Basics of Surgical Oncology

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Abstract

This article aims to standardize terms used in Surgical Oncology that are the basis for the treatment of cancer patients. Terms like: Patient out of cancer treatment, Patient in stage IV, In block tumor resection, Ganglionic relay, Local and regional control, Systemic Control, Unknown Primary Origin, Unresectability, Inoperability, Multiple Organ Resection, Preoperative Nutritional Status, Minimum Oncologic Procedure, Resection margins, Prognostic Factors, Peritoneal Washing Cytology, Adjuvant, Neoadjuvant and Peri-adjuvant Therapy.

Keywords: Basic terms in Surgical Oncology; Cancer Surgery

Abbreviations: OCT: Patient Out of Cancer Treatment; UPO: Unknown Primary Origin; BMI: Body Mass Index.

Introduction

There are basic oncological principles universally accepted and those principles were born from the experience accumulated in Cancer Treatment Centers after years of observing the results obtained in large series of patients undergoing various treatment protocols both medical and surgical. We will define these concepts or basic criteria that should be on the minds of all physicians who manage patients with cancer. To address the issue we will split the patients into two groups: OCT patients and patients admitted for treatment.

Patient out of cancer treatment (OCT)

A patient is OCT when IS NOT A CANDIDATE for treatment except palliation. This is accomplished with the following criteria:

Patient in stage IV not requiring palliative surgery: Patients that should be excluded from this category are:

Unknown Primary Origin: Since in this case the patient may have a neoplasm that may be treatable (such as lymphoma).

Lymphoma, myeloma or leukemia: These patients can be offered node biopsy or bone marrow studies and treatment with chemotherapy or radiotherapy.

Choriocarcinoma and Gestational Trophoblastic Disease: These tumors are very sensitive to Methotrexate.

Ovarian Cancers: These patients are candidates to Cytoreductive Surgery and Chemotherapy.

Seminoma and testicular tumors: Patients that are also candidates to cytoreductive surgery and radiotherapy.

Breast cancer: Advanced stage may be treated with chemotherapy and radiotherapy.

Prostate cancer: These are radiosensitive tumors.

Palliation should only be done when the patient himself requests it.

Gallbladder and bile duct Cancers CAN NOT BE TREATED WITH SURGERY. Those are best palliated with computerized brachytherapy.

Multiple studies have shown that a temporary palliation can be achieved with ultrasound-guided percutaneous drainage. But currently the best palliative treatment for these cancers is computerized brachytherapy. Gallbladder cancer in an early stage is curable with cholecystectomy alone. Advanced stages do not improve their prognosis with surgical resection (segmentectomy of IV segment, lobectomy). Surgery has proven to be counterproductive (it shortens survival and impairs the patient's quality of life). Patients with gallbladder and bile duct cancer (intra or extrahepatic) are not admitted for surgical treatment as they are inoperable, they cannot receive Chemotherapy (tumor is not chemosensitive), neither radiotherapy (liver tissue is too sensitive to radiation and it will damage the liver before it hits the tumor). The only suitable treatment is computerized brachytherapy.

A Patient is in Stage IV When

- a. There is ganglionic invasion beyond a certain node relay.
- b. There are lung metastases (circular images in X-rays).
- c. There are liver metastases (demonstrated by ultrasonography or elevated transaminases).
- d. There are bone metastases (in X-ray series and bone alkaline phosphatase elevation).
- e. There are brain metastases (CT Scan).

It is important to first do all these determinations to decide whether or not a patient is in stage IV.

Patient Admitted for Cancer Treatment

Before deciding on the type of surgery and the purpose of it (palliative, diagnostic or curative) is necessary to consider each

Table 1: Ganglionic relays for some tumors.

Thyroid cancer	Level 5, paratracheal lymph nodes, Levels 2, 3 and 4; Carotid ganglia.
Oral cavity cancer	Level 1, suprahyoid region ganglia.
Cancers of the chest	Mediastinal lymph nodes.
Skin cancers at the torso	Axillary and/or groin ganglia according to the proximity of the tumor to the lymph node group. In these cases a radioactive tracer or dye PATENT BLUE # 5 is used to decide which node group must be removed.
Skin cancers of the limbs	Axillary and/or groin lymph nodes according to the affected limb. When femoral lymph dissection is done an intraoperative pathologic study of the Crural Septum ganglion should be done. If this ganglion is affected, an iliac node dissection should be performed.
Abdominal cavity tumors	Node groups 1 to 11 of the Japanese Classification, level 12 onwards are considered metastasis (is a criterion of unresectability).
Pelvic cavity tumors	Lymph nodes of the obturator fossa, internal iliac nodes, external iliac nodes and common iliac nodes.

Local and regional control.

No radical surgery can achieve a Cancer Systemic Control. It has been established that there is no surgical procedure in any type of tumor (except carcinoma in situ in some cases) which can guarantee that no tumor cells have been left in the patient. The surgeon can only remove the tumor and the first lymph node levels. In gastric cancer Japanese have proposed extensive resections but no significant advantages have been found. In breast cancer the three nodal levels can be removed and in neck cancers a radical dissection can be performed but even in these cases the surgeon is only cleaning the first node levels. The only way to achieve a Cancer Systemic Control is with chemotherapy, radiation and/or hormone therapy. So in general a patient should be referred to the Medical Oncologist.

In some cancers, radiation therapy has replaced surgery as it has been shown to achieve the local and regional control equally or even better than surgery, because surgery sometimes is mutilating. In Oral Cavity and Pharynx Cancers Radiotherapy

of the following concepts.

In Block Tumor Resection

It is when a tumor is removed in continuity with its ganglionic nodes in a single block. This is the ideal in Oncology because if the tumor is removed and the ganglionic tissue is removed apart, the lymph paths between the nodes and the tumor will be open and we will be spreading the tumor. It may not always be possible to do so, but if the tumor is in continuity with the corresponding relay node, an In block resection must be planned.

First Lymph Node Relay

In cancers with lymphatic spread a group of nodes is established for each tumor that are the gateway for producing metastasis. A better local and regional control of the disease is achieved if this group of nodes is removed. Ganglionic relays for some tumors are (Table 1):

is better than surgery for stages I-II. Also Radiotherapy is better than Surgery for Cervical Uterine Cancer stage IIB. When operating a patient with Uterine Cervical Cancer one should keep in mind that if we find parametrial induration the Surgery should be suspended, and the patient should be referred for Radiation Therapy. We would only increase the morbidity of these patients if we perform a hysterectomy.

Unknown primary origin (UPO)

In this term there is a discrepancy in the literature but I consider it is more practical to define it as a stage IV cancer in which it was not possible to identify the primary origin. These patients are examined because a treatable tumor can be found, especially when the biopsy reports an undifferentiated tumor (that usually is really a lymphoma). In these patients a laparoscopic retroperitoneal lymph node biopsy is performed if needed for diagnosis. In such cases the purpose of surgery is to make diagnosis or palliation, not a curative surgery.

Unresectability

It is considered that a tumor is unresectable if it is in an advanced stage and the tumor cannot be removed, even if a radical surgery is performed. This occurs in stage IV tumors or in cases of Carcinomatosis. Unresectability does not contraindicate surgery and can be done with palliative or diagnostic purposes.

Inoperability

It is when the patient’s physical condition has a prohibitive surgical risk, such as in elderly patients with heart, renal, respiratory or liver failure, etc. Inoperability in some patients can be treated and the patient becomes suitable for surgery.

Multiorgan resection

It is defined when a radical resection may affect three or more organs. This is an Inoperability criterion. This is a treatable condition because in some tumors preoperative chemotherapy or radiotherapy can reduce tumor volume and thus make it operable.

Nutritional status

Allows evaluating the patient’s condition to tolerate the post-surgical metabolism. It is very important to determine the nutritional status in every patient that will be subjected to any type of surgery, especially in cancer patients because tumors producing catabolism is something very common. This ideally should be determined by the nutritionist. But when you do not have an expert in this field the surgeon can make a fairly accurate

estimate with the following parameters:

BMI or Body Mass Index: It is determined by dividing weight in kilograms by the square of height in meters. An index that is less than 20 is an inoperability criteria.

Serum Albumin: A serum albumin value lower than 2 g/dl is an inoperability criteria.

Total lymphocyte count: This value is obtained by multiplying the percentage of lymphocytes by the total leukocytes (white blood cell count). A value less than 1000 total lymphocytes is an inoperability criteria.

There are more parameters to determine the nutritional status but with only these three that are accessible in almost all hospitals the surgeon can justify the patient’s condition for surgery. When the nutritional status of a patient indicates inoperability criteria, the patient must be submitted to a supplementary diet until the total number of lymphocytes and serum albumin levels are correct, which usually requires a dietary supplement (like Ensure 1 can 3 times a day) and a high calorie and a high protein diet for a period of at least 15 days.

Minimum Oncological procedure

The minimum surgical procedures are already defined in the literature. These are to be performed for certain types of tumors and are the minimal tumor resection for an oncologically valid surgery (Table 2).

Some examples are:

Table 2: Minimum Surgical Procedures.

Primary Tumor	Minimum Oncologic Procedure
Colon cancer	Hemicolectomy
Thyroid cancer	Hemithyroidectomy with isthmectomy
Liver cancer	Lobectomy
Lung cancer	Lobectomy
Gastric cancer	Subtotal gastrectomy: Needed to completely remove the first node relay.
Testicular tumor	Radical inguinal orchiectomy with resection of the spermatic cord. Never perform trans-scrotal biopsy or orchiectomy because this will spread the tumor.
Ampulla, duodenum or head of the pancreas cancers.	Whipple procedure with pyloric preservation. It is necessary to adequately remove the first node relay.

Resection margins

Is the distance in centimeters left between the edge of the tumor and the cut made to remove it. To avoid the risk of leaving tumor cells the surgeon should always remove a certain amount of healthy tissue around the tumor. This amount of healthy tissue is measured in centimeters and in the literature is already determined how many centimeters away from the edge of the tumor are necessary. This should be measured in the surgical specimen during the operation by the pathologist to see if it is necessary to expand the resection. In general most tumors need

a resection margin of at least 2 cm for a proper oncological resection but some tumors need a wider resection margin.

Adverse prognostic factors.

These serve to establish the prognosis of a cancer patient and therefore the need for surgery. These are not the “Risk factors”. A Risk factor is a history of factors that increases the chances of having a cancer, such as: smoking for lung cancer, contraceptives for breast cancer, etc. Adverse prognostic factors are those that determine the probability of death at 1 and 5 years in a patient who has been diagnosed with cancer. These vary according

to the type of tumor and usually these are determined by the pathological study of a biopsy or a surgical specimen.

Prognostic factors that are common to all cancers:

The stage of the tumor. The TNM classification is universal. As a rule all tumors having ganglionic invasion beyond the first relay node or tumors that invade the muscle layer or the serous membrane have a poor prognosis. There is data available to determine the probability of death at 1 and 5 years for each tumor. It has been established that a surgical procedure is justified when the probability of survival at 1 year is greater or equal to 15% (or mortality at one year is less than 85%).

The degree of differentiation. Grade II or III (moderately differentiated and poorly differentiated tumors) is a factor of poor prognosis.

The pattern of spread. Well defined tumor edges have a better prognosis than infiltrating edges. "Fingerlike" or "raindrops" pattern of spread have a poor prognosis.

Tumor volume. This can be measured in the CT Scan (ask the radiologist). Except in epithelial ovarian cancer and choriocarcinoma it has been observed that a tumor volume close to 1 kg is incompatible with life.

Peritoneal Lavage Cytology

This is a mandatory procedure in surgery of any tumor that is within the abdominal cavity. It consists of instilling 100 cc of Sterile Saline Solution in the abdominal cavity and then 50 cc should be recovered. During the operation this sample is sent to be studied by the pathologist. If the pathologist reports neoplastic cells in the peritoneal lavage this is a criterion of unresectability and the surgical procedure should be interrupted if it is not for palliation purposes. In this case it is not convenient to realize an extensive surgery because all tissue cleavage sites release growth factors and trophic factors that accelerate the implantation of tumor cells and thus the spread of the tumor, and the patient survival will be shortened. Other protocols use in addition multiple biopsies including: biopsy of para-aortic

nodes, biopsy of parietal peritoneum, spleen and liver biopsy to determine if there is tumor spread before performing the surgical procedure.

Adjuvant, neoadjuvant and peri-adjuvant

In several types of cancers is necessary to apply Chemoradiotherapy before surgery or after. Before surgery (neoadjuvant therapy) reduces the tumor stage and increases the likelihood that the resection margins will be negative to tumor cells. Also we must remember that no radical surgery can achieve Systemic cancer control. For example, in rectal cancer it is already accepted worldwide that preoperative Chemoradiotherapy increases the likelihood of a curative resective surgery. In some tumors where the neoadjuvant Chemoradiotherapy is not used a subsequent systemic treatment (adjuvant therapy) within 6 to 8 weeks after the surgery it is recommended. Peri-adjuvant is when you apply Chemoradiotherapy before and after surgery [1-5].

Conclusion

It is important to standardize the basics of Surgical Oncology.

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