

# PRINCIPLES OF ONCOLOGY

**Dept. of Surgery**

## ETIOLOGY OF CANCER

A cancer, is thought to develop from a cell in which the normal mechanisms for control of growth and proliferation are altered.

Current evidence supports the concept of carcinogenesis as a multistage process that is genetically regulated

The first step in this process is *initiation*, which requires exposure of normal cells to carcinogenic substances.

Substances that may act as carcinogens or initiators include chemical, physical, and biologic agents

Two major classes of genes are involved in carcinogenesis: oncogenes and tumor suppressor genes

## **PATHOLOGY OF CANCER**

Tumors may arise from any of four basic tissue types

- Epithelial tissue
- Connective tissue (Muscle, bone, and cartilage)
- Lymphoid tissue
- Nerve tissue

Malignant cells are divided into those of epithelial origin or the other tissue types.

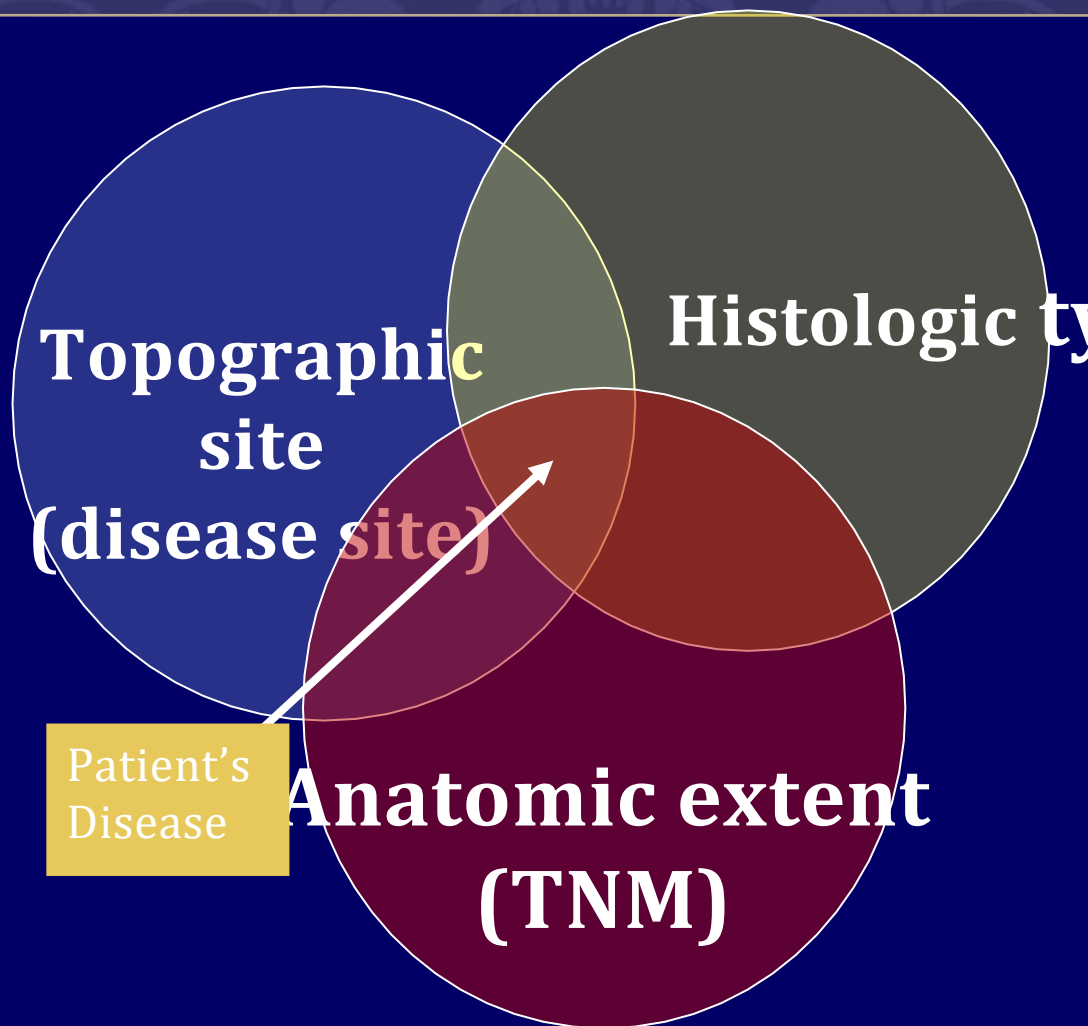
- Carcinomas are malignant growths arising from epithelial cells.
- Sarcomas are malignant growths of muscle or connective tissue.
- Adenocarcinoma is a malignant tumor arising from glandular tissue.

### **TUMOR CHARACTERISTICS**

- Invade and destroy the surrounding tissue.
- The cells are genetically unstable
- Loss of normal cell architecture results in cells that are atypical of their origin.
- Lose the ability to perform their usual functions.
- Metastasize, and consequently, recurrences are common after removal or destruction of the primary tumor.

## THE THREE AXES OF CANCER CLASSIFICATION

- Topographic site
- Histology
- Anatomic extent  
(Staging)



## Staging: Why?

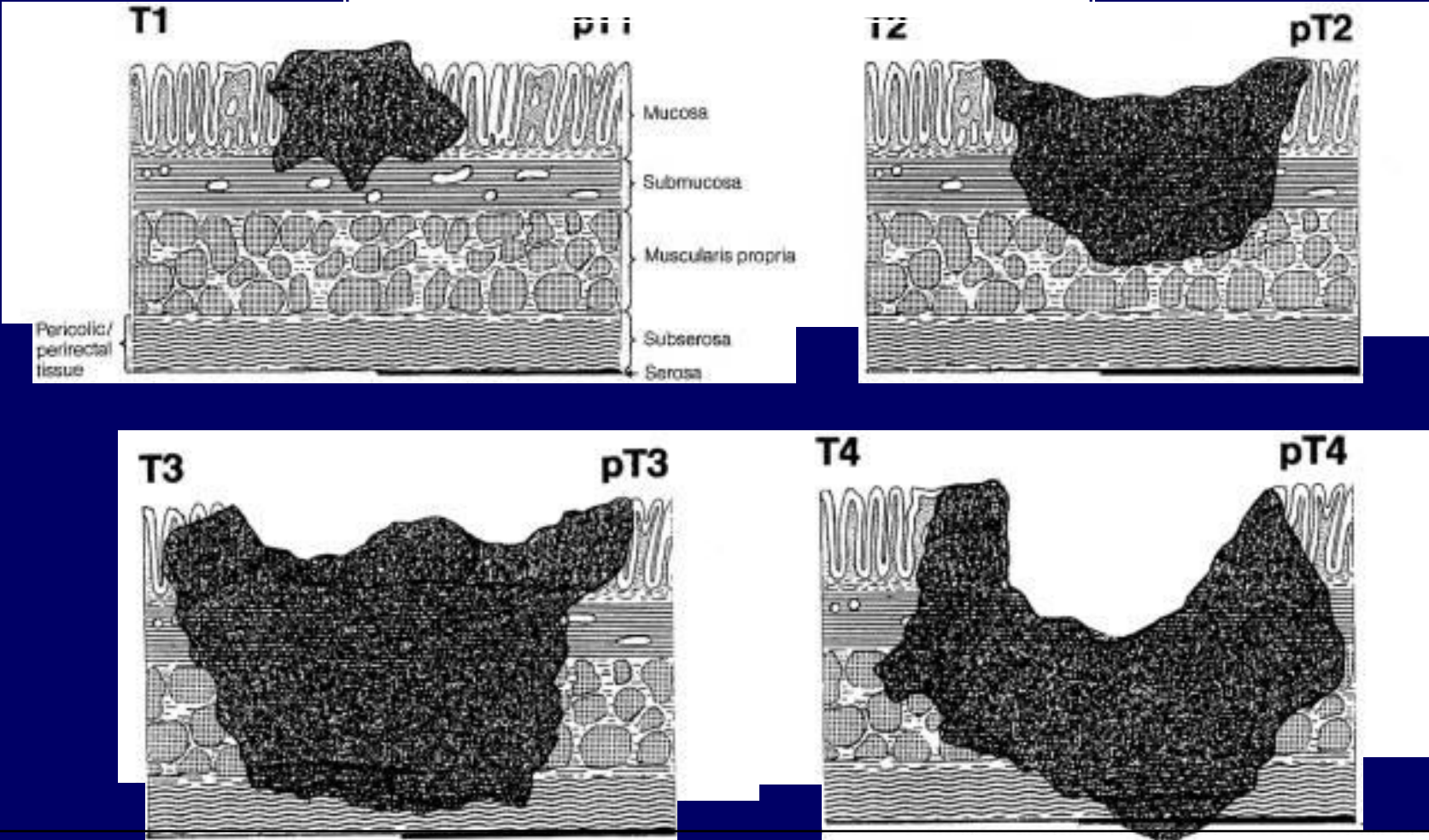
- To aid the clinician in planning treatment
- To give some indication of prognosis
- To assist in evaluating the results of treatment
- To facilitate the exchange of information between treatment centers
- To contribute to continuing investigations of human malignancies

ANATOMIC STAGING

Based on three components

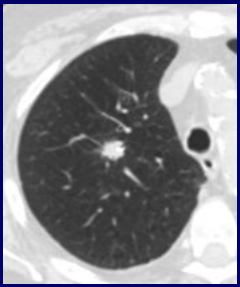
T	The extent of the primary tumor
N	The absence or presence and extent of regional lymph node metastasis
M	The absence or presence of distant metastasis

TUMOR (T): COLORECTAL CANCER

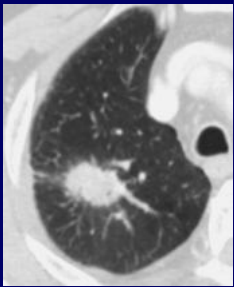




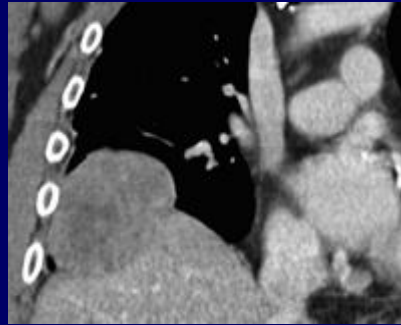
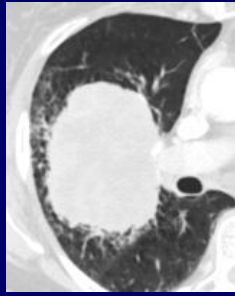
## TUMOR (T): LUNG CANCER



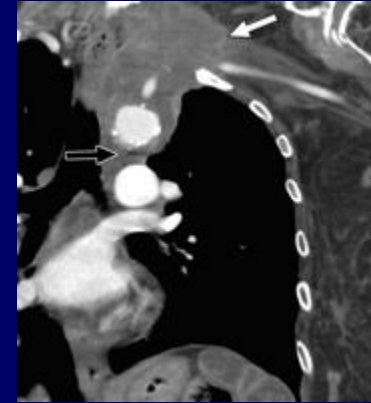
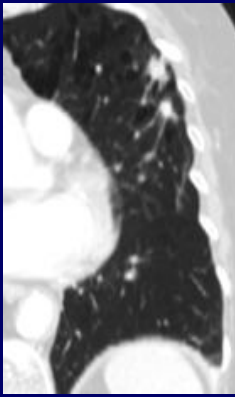
T1



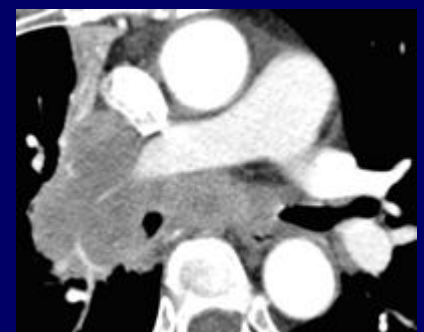
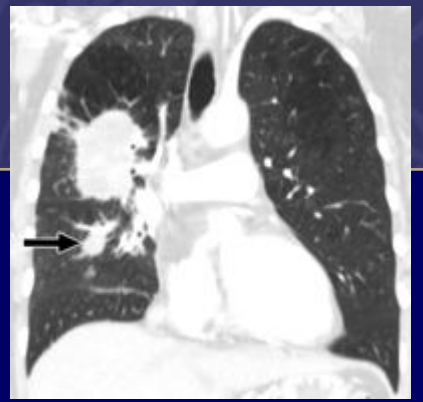
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T3



T4



## CLINICAL, PATHOLOGIC, COLLABORATIVE STAGING

### Clinical (cT, cN, cM)

Before initiation of primary treatment

Important in deciding primary treatment

### Pathologic (pT, pN, pM)

From resected tissues

### Collaborative (CS)

Clinical, pathologic staging & non anatomic (site-specific) factors

## LIMITATIONS OF STAGING

### Not used in hematologic malignancies

Ann Arbor Staging System

Not used in pediatric cancer

Not useful in rare diseases

Not enough cases to stratify T, N, M (Merkel Cell Cancer)

Lumping different histopathologic subtypes (Soft tissue sarcoma: multiple histologies)

Dominated by anatomic pathology and histology (size, nodes, histopathology, grade)

Gradually incorporating other prognostic variables

## DESCRIPTORS

Suffix	m	Presence of multiple primary T	pT(m)NM
Prefix	y	Post initial treatment (staging after preop treatment)	ycTNM or ypTNM
	r	Recurrent tumor after a disease free interval	rTNM
	a	Autopsy	aTNM

OTHER FACTORS

Histopathologic subtype

Adenocarcinoma, SCCA

Histology/Grade

Poor, mod, well differentiated, Undifferentiated

Lymphovascular invasion

Residual tumor

RX, R0 – 2 resections

Site-specific factors

- Breast: ER, PR, Her2-neu
- Thyroid: Age
- CRC: Microsatellite instability, MMR, K-ras status
- Prostate: PSA, Gleason’s Score

STAGING IN THE FUTURE?

Essential Factors	TNM categories	Histologic grade
	Extramural venous invasion	Obstruction
	Quality of surgery	
Additional Factors	Grade	Tumor perforation
	Perineural invasion	Invasion pattern
	Medullary type	CEA serum level
	Number of lymph nodes resected	
	Peritumoral lymphoid reaction	
New and Promising Factors	Microsatellite instability	LOH 18q status
	P53	DNA ploidy
	VEGF, K-ras expression	20q copy number

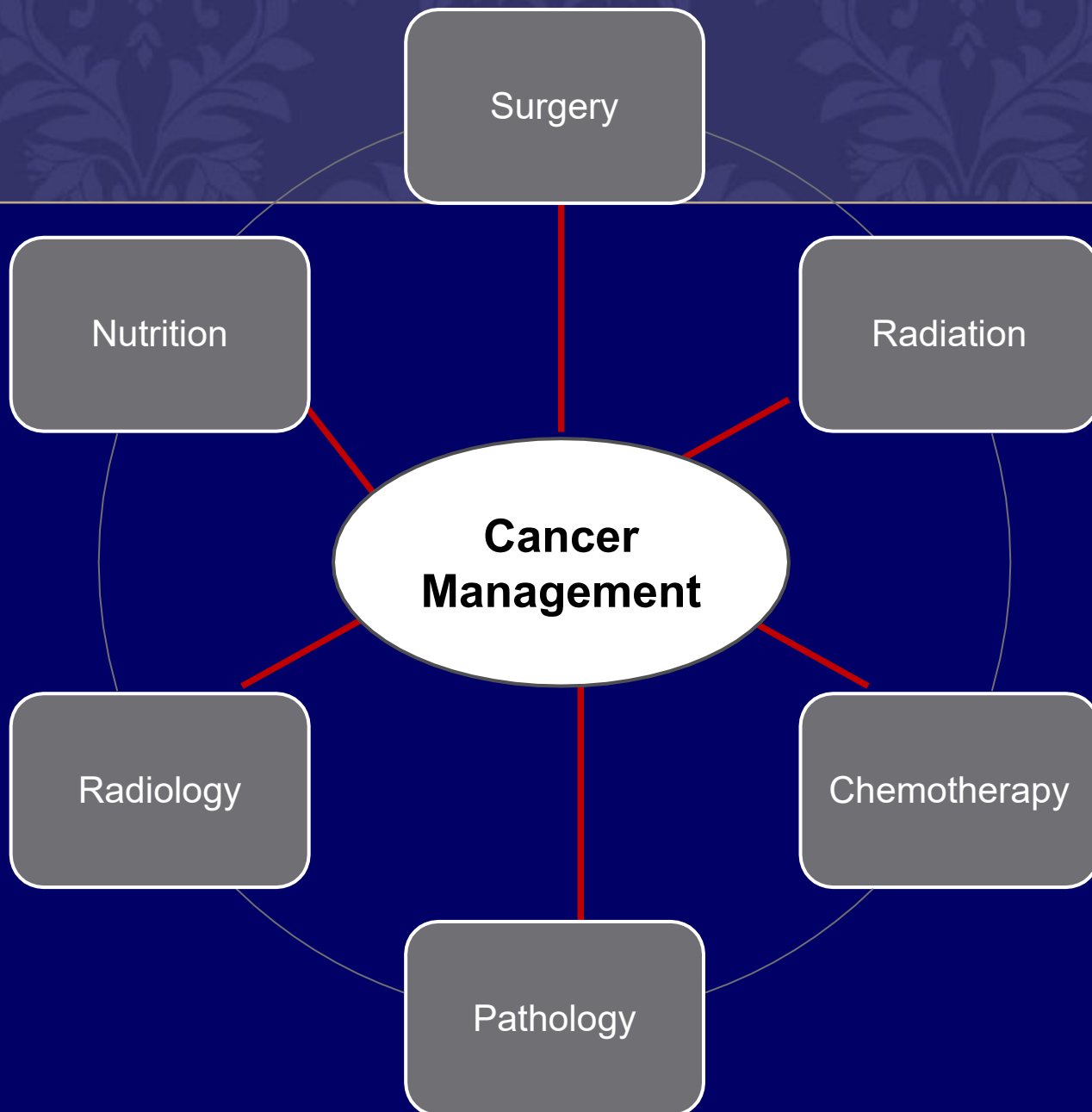


## MANAGEMENT

- **Prevention**
- **Screening**
- **Diagnosis**
- **Treatment**
- **Rehabilitation**
- **Follow-up care**
- **Palliative care**
- **Terminal Care**



## MULTIDISCIPLINARY APPROACH FOR MANAGEMENT



### GOALS OF CANCER TREATMENT

#### 1- Primary goal

*Cure the patient*

Render him clinically and pathologically free of disease and return their life expectancy to that of healthy individuals of the same age and sex.

**GOALS OF CANCER TREATMENT**

## **2- The best alternative goal**

To prolong survival while maintaining the patient's functional status and quality of life.

## **3- The 3rd goal**

Relieve symptoms such as pain for patients in whom the likelihood of cure or prolonged survival is very low

## **SURGERY**

Long considered the most important aspect of cancer treatment for solid tumours

Controls the disease locally

May be curative for many tumours especially if caught early

## **RADIATION THERAPY**

- Local therapy
- Causes DNA damage to cancer cells and leads to their death
- May be curative on its own

## **CHEMOTHERAPY**

- Multitude of drugs developed to kill cancer cells
- DNA damage, RNA damage, inhibit cell growth and division, antimetabolites
- Can be used as sole modality for cure (hematologic malignancies) or as adjunct to either surgery or radiation to cure
- May also be given to incurable individuals to palliate



## NEW PARADIGM OF TREATMENT

- Target unique proteins/genes/structures in cancer cells with novel agents
- Differential toxicity between the tumour cell and normal tissues
- More specificity for tumours makes cancer kill greater
- Combine newer treatments with traditional strategies
- Molecular profiling
  - Oncogenes, protooncogenes, apoptotic markers, cytogenetics