COMPLICATIONS OF BRACHYTHERAPY

BY

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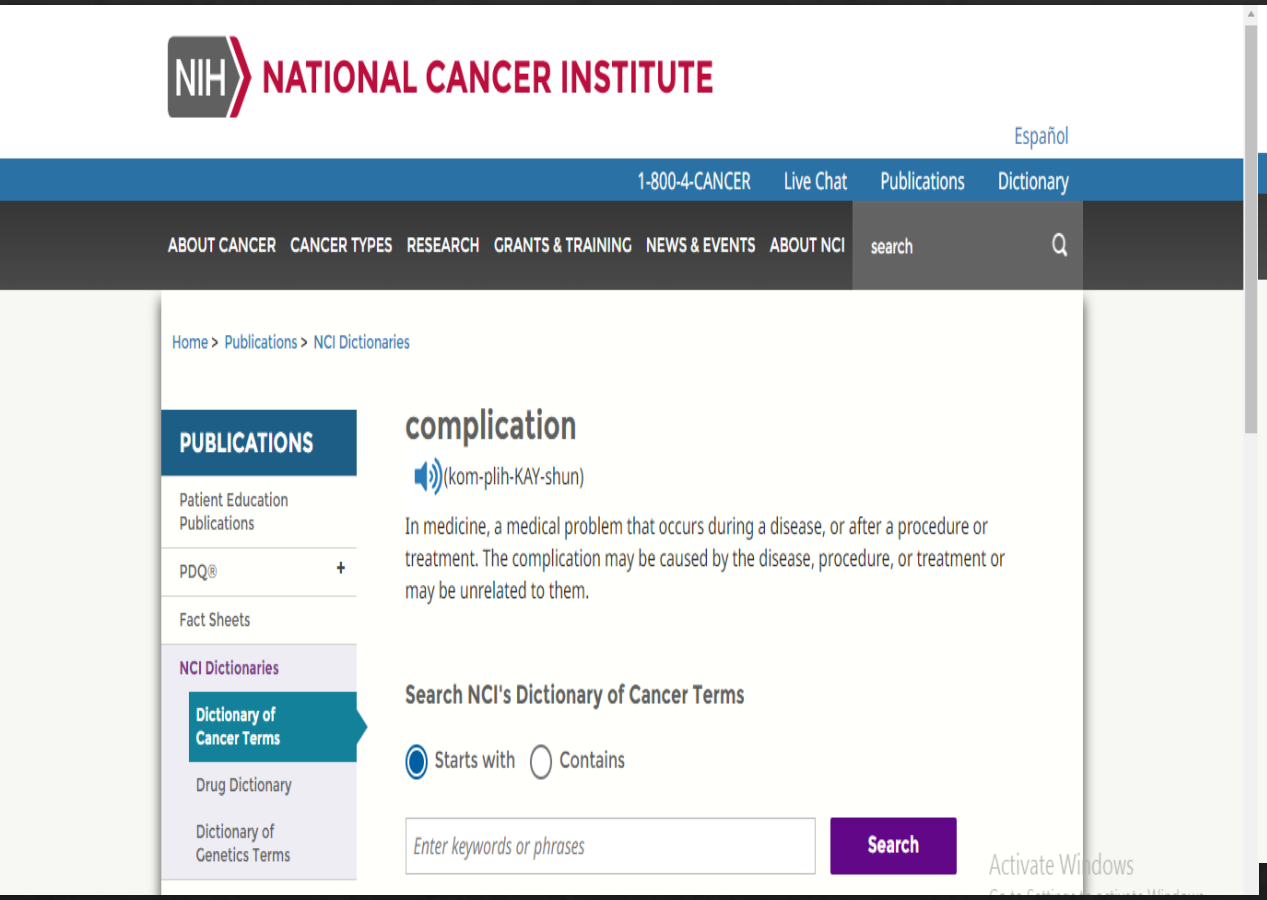
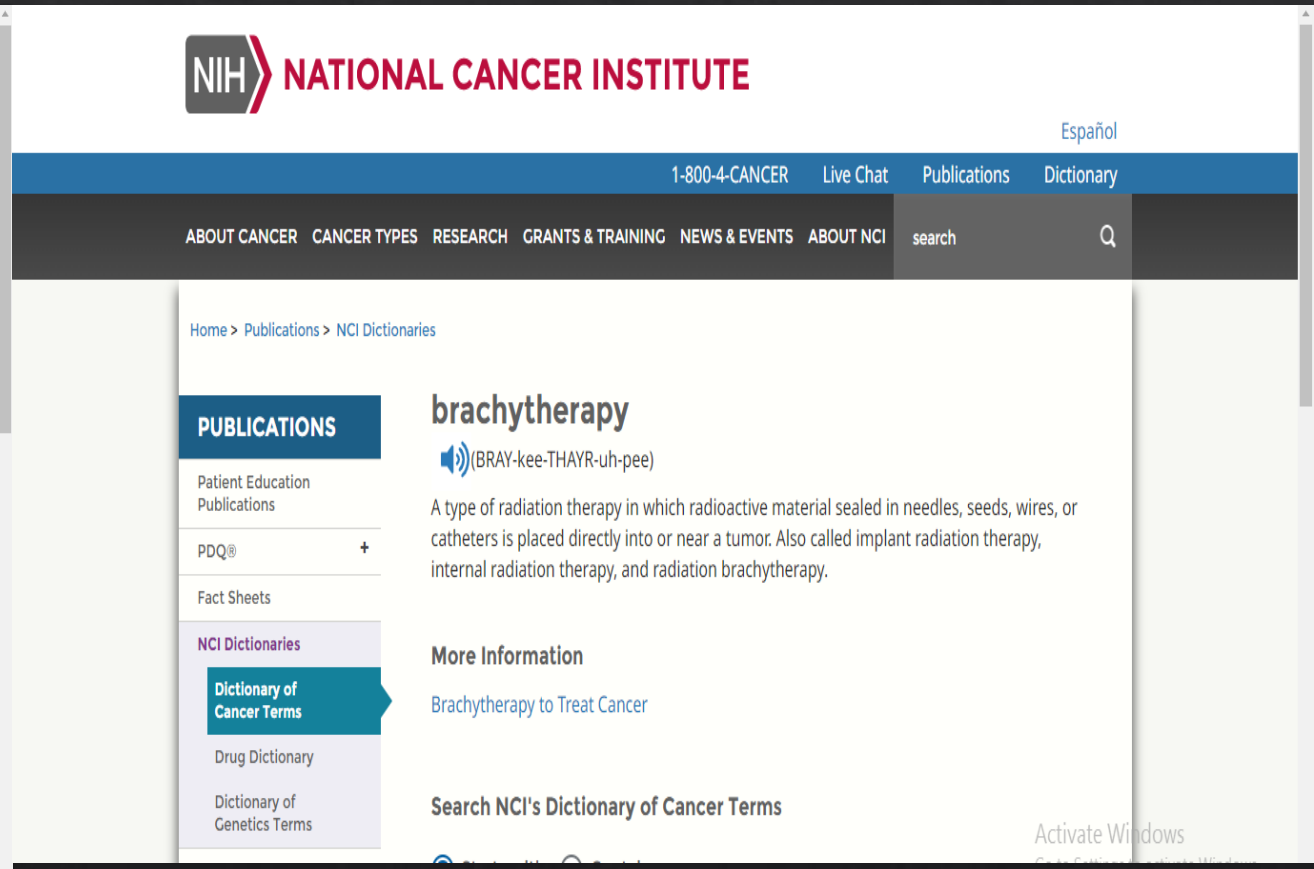
DEFINATION OF COMPLICATION & BRACHYTHERAPY





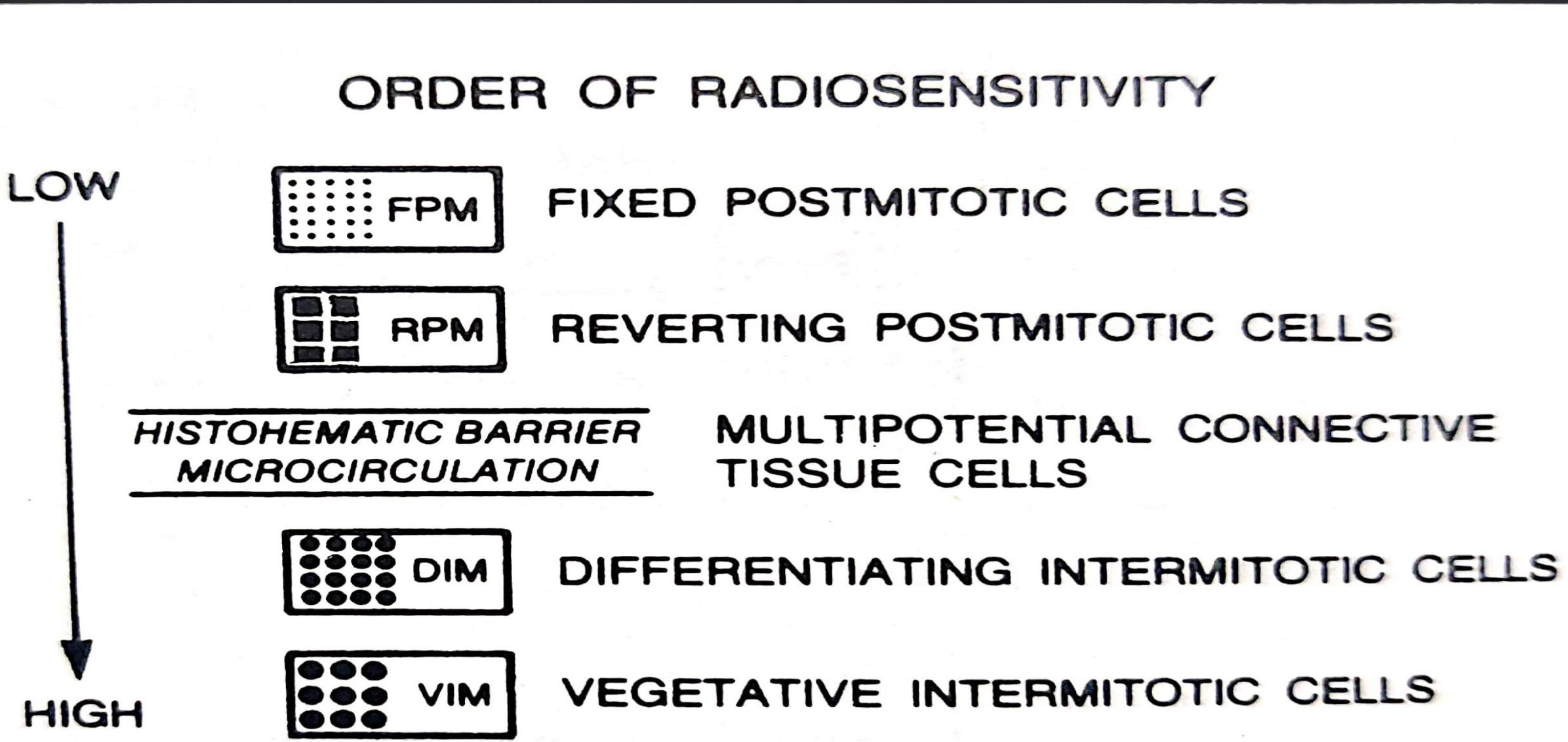
CASARETTS CLASSIFICATION OF MAMMALIAN CELL RADIOSENSITIVITY

Cell Type	Properties	Examples	Sensitivity[a]
I Vegetative intermitotic cells	Divide regularly, no differentiation	Erythroblasts, intestinal crypt cells	High
II Differentiating intermitotic cells	Divide regularly; some differentiation between divisions	Germincal cells of epidermis Myelocytes	
Connective tissue cells[b]			
III Reverting postmitotic cells	Do not divide regularly; variably differentiated	Liver	
IV Fixed postmitotic cells	Do not divide; highly differentiated	Nerve cells, muscle cells	Low

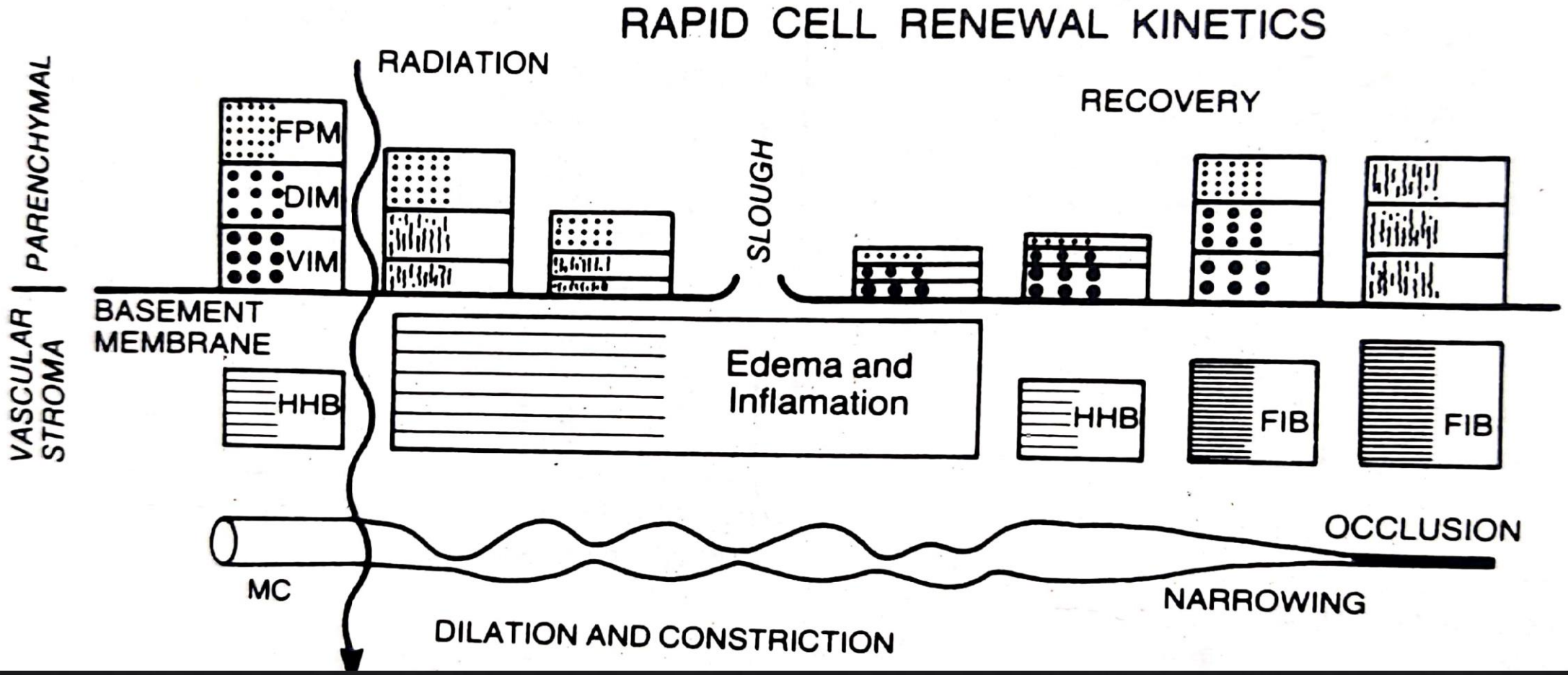
[a]Sensitivity decreases for each successive group

[b]Intermediate in sensitivity between groups II and III

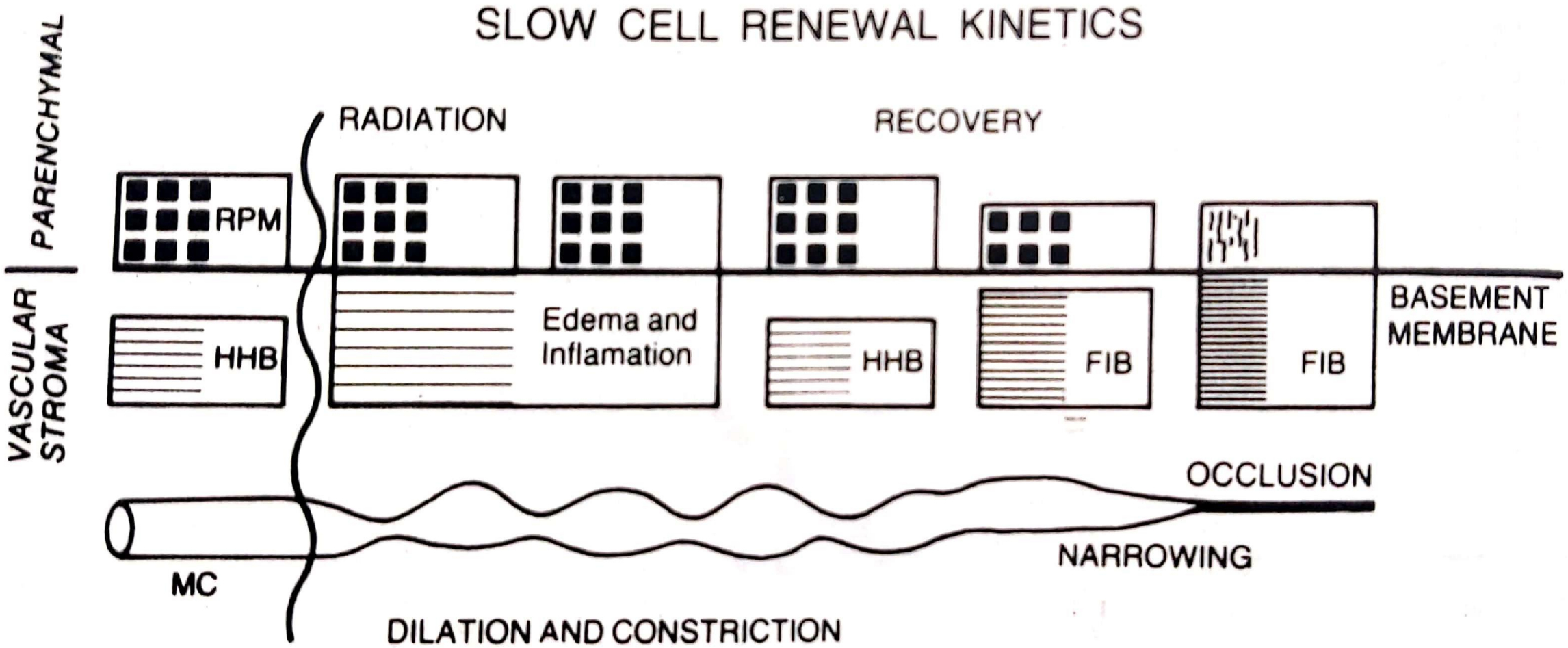
PHILOSOPHY BEHIND THE COMPLICATIONS IN BRACHYTHERAPY



RAPIDLY PROLIFERATING TISSUE,ACUTE TOXICITY



SLOW RENEWAL KINETICS,LATE TOXICITY



FACTORS PREDICTING THE COMPLICATIONS IN BRACHYTHERAPY

- DOSE PER FRACTION
- NO OF FRACTIONS
- INTERFRACTION INTERVAL
- TOTAL DOSE
- IMPACT ON TYPE OF TISSUES
- RADIATION TECHNIQUES

SCOPE OF BRACHYTHERAPY

- CARCINOMA HEAD AND NECK:- INTERSTITIAL,SURFACE MOULD,INTRA CAVITARY
- ESOPHAGUS,BRONCHUS:-INTRALUMUNAL
- BREAST:-INTERSTITIAL/INTRA CAVITARY
- CERVIX:-INTRACAVITARY,INTERSTITIAL
- PROSTATE:-INTERSTITIAL:-PERMANENT/TEMPORARY
- ANAL CANAL/RECTUM:- INTRALUMINAL

HEAD AND NECK CANCERS

Complications due

- BRACHYTHERAPY PROCEDURE
- RADIATION.

HEAD AND NECK
Procedural Complications

I. Hemorrhage – Primary And Secondary
II. Infection
III. Airway Complications- Aspiration
IV. Venous Thrombosis

MINIMIZING PROCEDURAL COMPLICATIONS

- CO-ORDINATED EFFORTS OF WELL-INFORMED TEAM OF A RADIATION ONCOLOGIST ANESTHESIOLOGIST, HEAD AND NECK SURGEONS, PLASTIC SURGEONS, A DENTAL SURGEON, AND PHYSICISTS.
- PRE IMPLANT ASSESSMENT.
- METICULOUSLY PLANNED PLACEMENT OF THE APPLICATOR/CATHETER , DRAIN AND TRACHEOSTOMY AND WOUND CLOSURE TECHNIQUES.
- PROPER PLACEMENT OF DRAIN SO THAT IT WILL NEVER INTERFER WITH LOADING AND UNLOADING PROCEDURES.
- COORDINATION OF THE WOUND CLOSURE PROCEDURE WILL MINIMIZE ANY POTENTIAL TENSION, DAMAGE, AND DISTORTION OF THE IMPLANTED CATHETERS AND ITS GEOMETRY.
- PROPER POST OP CARE BY TRAINED NURSING PERSONEL TO AVOID INFECTION AND WOUND COMPLICATIONS THAT ALLOWS SUFFICIENT FIBROBLAST TO PROLIFERATE IN EXTREMITY SARCOMAS.
- FOLLOWING COMPLETION OF THE BRACHYTHERAPY, REMOVAL OF THE CATHETERS SHOULD BE DONE WITH THE COORDINATION OF THE HEAD AND NECK SURGICAL TEAM IF NEEDED
- ARTERIAL HEMORRHAGE- DURING THE REMOVAL OF THE IMPLANTED CATHETERS , CAN BE EFFECTIVELY CONTROLLED WITH BIDIGITAL COMPRESSION.

ACUTE COMPLICATIONS AND THEIR MANAGEMENT,HEAD AND NECK

- **PAIN**
- **MUCOSAL EDEMA**
- **MUCOSITIS**

The patient and the family need to be informed about the course of the radiation effects and optimal home care measures. Home care recommendations include:

1.ORAL RINSES WITH 1–2 % BICARBONATE EVERY 1–2 H WHILE AWAKE.

2. KEEP IMPLANT EXIT SITES CLEAN AND DRY; AVOID LOTIONS .

3. WASHING AND SHOWERING FACE AND NECK STARTING 24 H AFTER IMPLANT REMOVAL.

4. ORAL INTAKE – ADVANCE AS TOLERATED FOR PATIENTS WHO CAN SWALLOW.

5. DIETARY SUPPLEMENTATION AND FEEDING TUBE SUPPORT AS NEEDED.

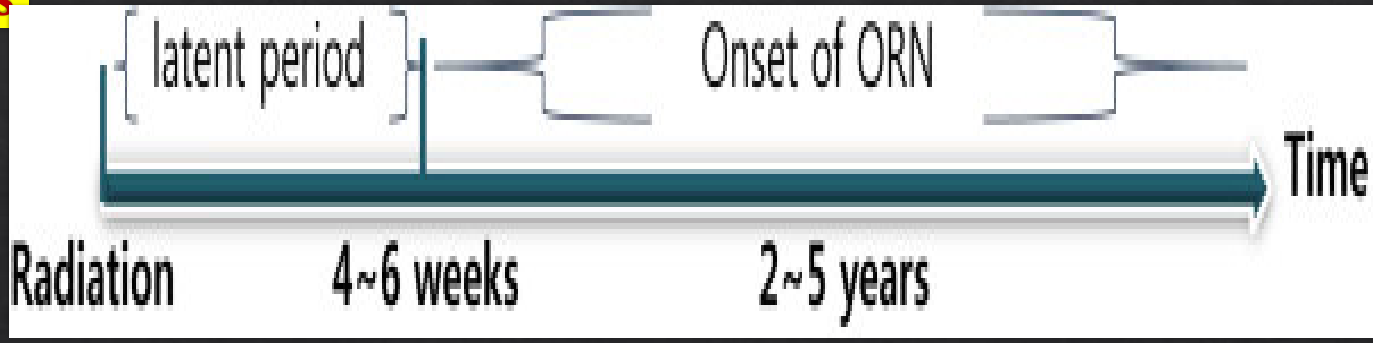
6. TRACHEOSTOMY SITE – KEEP CLEAN AND DRY; DRESS DAILY OR MORE OFTEN IF NEEDED.

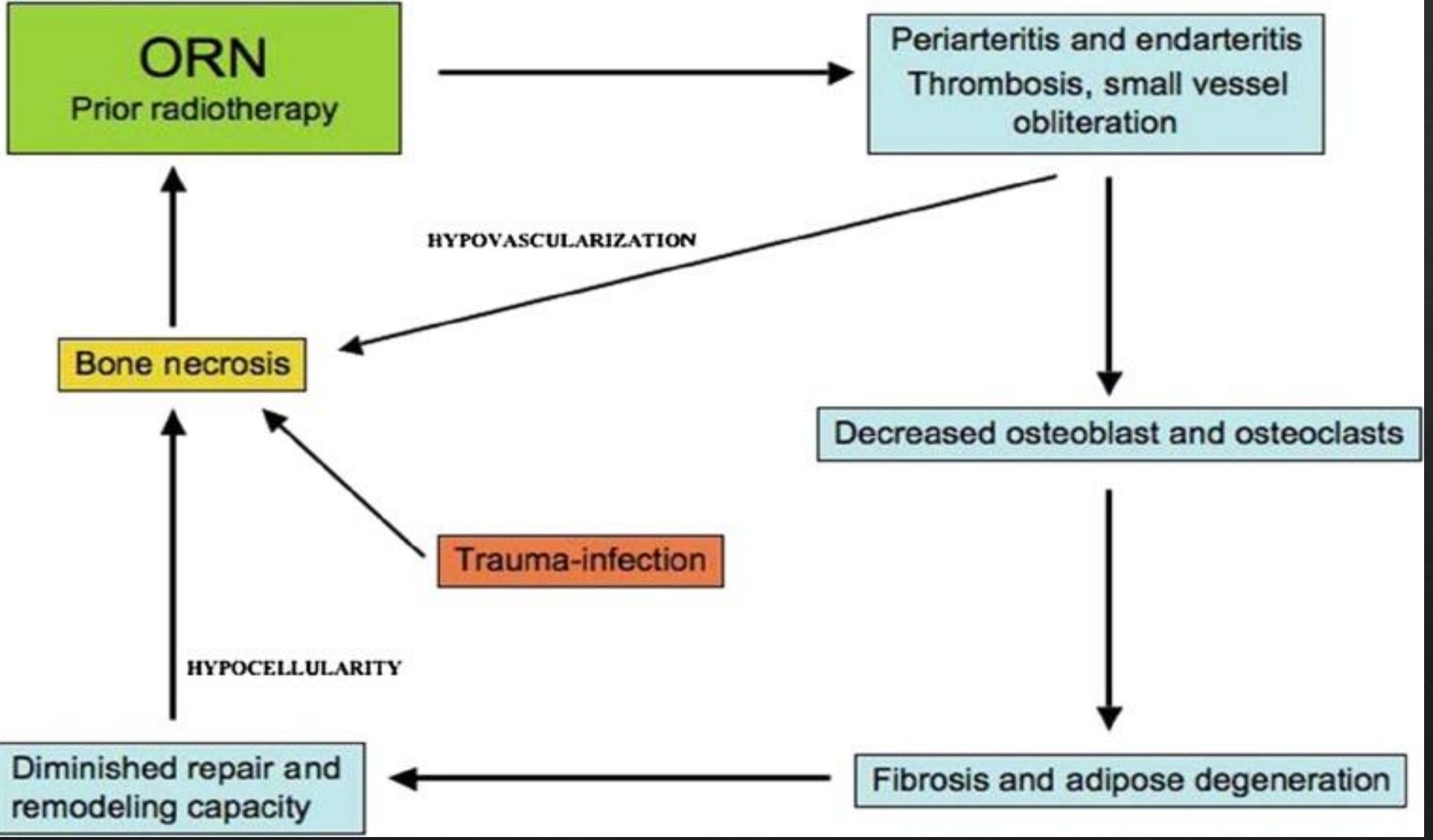
CHRONIC COMPLICATIONS HEAD AND NECK

- OSTEORADIOECROSIS
- CRANIAL NEUROPATHY
- TRISMUS
- SWALLOWING AND SPEECH DIFFICULTIES
- SECONDARY MALIGNANCIES

SOFT TISSUE NECROSIS AND OSTEORADIONECROSIS

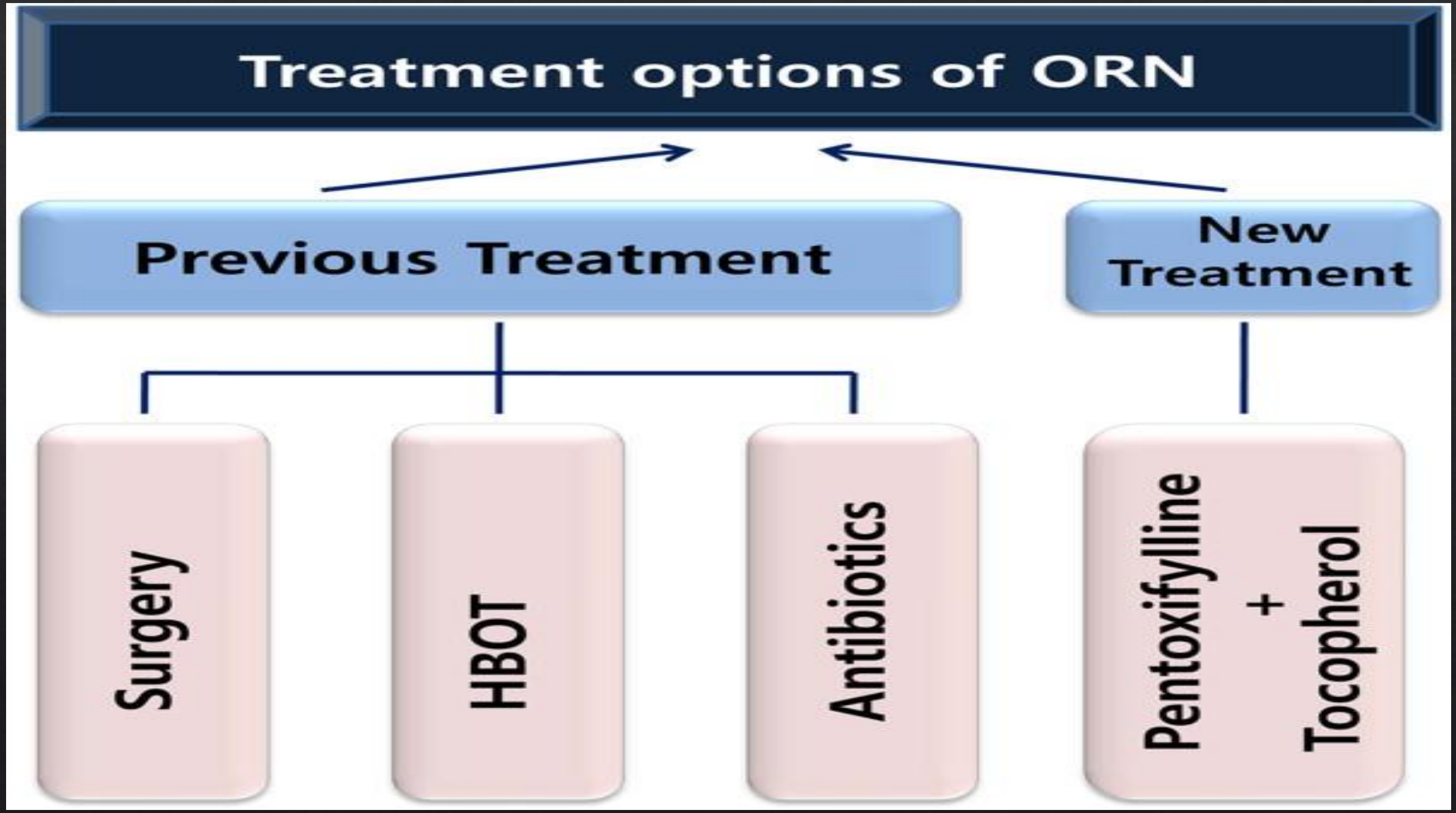
- **Greater incidence of soft tissue necrosis and osteoradinecrosis with brachytherapy than with EBRT.**
  - Depends on
    - **TOTAL DOSE RECEIVED**
    - **PROXIMITY TO BONE**
    - **DENTAL EXTRACTION**




ORN
Prior radiotherapy
Periarteritis and endarteritis
Thrombosis, small vessel obliteration
HYPOVASCULARIZATION
Bone necrosis
Decreased osteoblast and osteoclasts
Trauma-infection
HYPOCELLULARITY
Diminished repair and remodeling capacity
Fibrosis and adipose degeneration

OSTEORADIONECROSIS

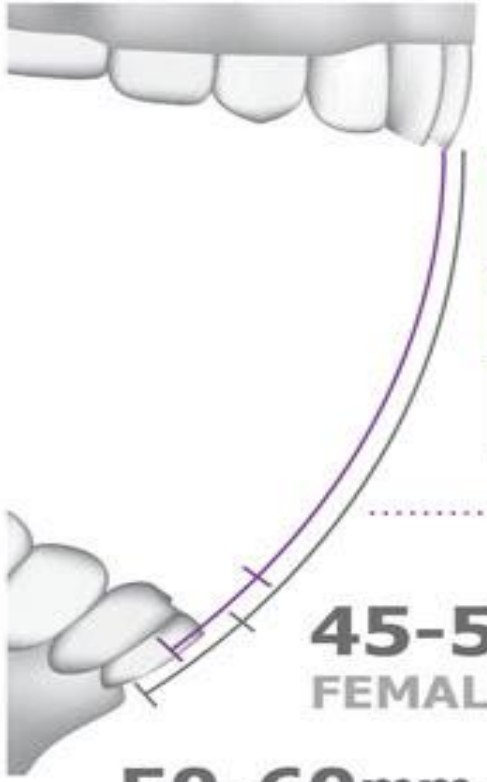
	Osteoradionecrosis of jaw
Characteristics	Irradiated bone becomes devitalized and exposed through the overlying skin or mucosa without healing for 3months, without recurrence of tumor
	Most case happen in mandible
	70-94% of cases developed within the first 3 years after radiotherapy
Risk factors	Hyperfractionated irradiation regimen - High total dose (6000-7000cGy)
	Recent reports have suggested that when chemotherapy is added to radiotherapy the incidence of ORN may be increased
	Pre-irradiation and post-irradiation dental extractions
	Poor oral hygien with periodontal disease
	Tobacco and alcohol use
Conservative treatment	Improve oral hygiene
	Minimal surgical debridement
	Hyperbaric oxygen therapy (HBOT)
	Medical management: pentoxifylline, tocopherol


Treatment options of ORN
Previous Treatment
New Treatment
Surgery
HBOT
Antibiotics
Pentoxifylline
+
Tocopherol

RTOG SEVERITY GRADE OF DYSPHAGIA

Grade	Description
0	No change over baseline
1	Mild dysphagia or odynophagia; may require topical anesthetic, non-narcotic agents, or soft diet
2	Moderate dysphagia or odynophagia; may require narcotics agents or pure/liquid diet
3	Severe dysphagia or odynophagia with dehydration or weight loss (>15% from pretreatment baseline) requiring nasogastric feeding tube, intravenous fluids, or hyperalimentation
4	Complete obstruction, ulceration, perforation, or fistula

RTOG GRADING OF TRISMUS



Severe

Moderate

Mild

45-55mm is the FEMALE avg. adult MIO.

50-60mm is the MALE avg. adult MIO.

Three-Finger Basic Diagnostic

SEVERE
< 1 Finger

Mild to Mod
< 2 Fingers

> 3 Fingers
"Normal" MIO

- Pointer Finger
- Middle Finger
  Non-Dominant Hand
- Ring Finger

The 3-Finger method generally accounts for body size, the primary determination of MIO. Normal **MIO** is about the height of a person's pointer, middle, and ring finger on their **NON-DOMINANT** hand.

SECOND MALIGNANCY

- INCIDENCE <≈20 % OF PATIENTS WITH HEAD AND NECK CANCERS.
- LUNG, ESOPHAGUS, AND HEAD AND NECK SITES MUST BE MONITORED FOR SECOND PRIMARY .
- THE PATIENTS MUST BE FOLLOWED CAREFULLY FOR LIFE, SCREENED, AND EVALUATED FOR RECURRENCE OF THE ORIGINAL PRIMARY, WHICH TENDS TO OCCUR EARLIER, AND A SECOND NEW PRIMARY CANCERS, WHICH TEND TO OCCUR LATER THAN RECURRENCES. THE DISTINCTION MAY BE DIFFICULT IN PATIENTS WITH ADJACENT RECURRENCES, SIMILAR HISTOLOGY, AND MODERATELY LONG DISEASE FREE INTERVALS.
- WHILE HYPOPHARYNX HAS THE HIGHEST RATE FOR SECOND MALIGNANCY, LARYNX HAS THE LOWEST RATE. HOWEVER, BOTH SITES HAVE THE PROPENSITY TO BE ASSOCIATED WITH BRONCHOGENIC CARCINOMA.
- THE MOST COMMON SITE FOR THE SECOND PRIMARY CANCERS FOR ORAL CAVITY AND OROPHARYNX PRIMARIES IS A NEW HEAD AND NECK CANCER
- MEASURES TO HELP THE PATIENT AVOID SMOKING, DRINKING, AND HPV EXPOSURE ARE GENERAL HEALTH IMPROVEMENTS THAT FAVORABLY IMPACT ON OUTCOME.

CRANIAL NEUROPATHY

CRANIAL NEUROPATHY, ALTHOUGH UNCOMMON, MORE COMMONNLY WITH BRACHYTHERAPY THAN WITH EBRT.

THE NERVES AT MOST RISK ARE THE HYPOGLOSSAL FOR TONGUE IMPLANTS AND THE VAGUS, GLOSSOPHARYNGEAL NERVES, AND SYMPATHETIC CHAIN FOR NECK IMPLANTS.

COMPLICATIONS OF BRACHYTHERAPY IN BREAST

ACUTE SIDE EFFECTS OF INTERSTITIAL BREAST BT INCLUDE

- **HEMATOMA FORMATION,**
- **EDEMA,**
- **INFECTION,**
- **ACUTE RADIATION DERMATITIS (MAINLY LIMITED TO THE NEEDLE PUNCTURE SITES), AND**
- **MASTALGIA**

THE RATE AND SEVERITY OF THESE EARLY COMPLICATIONS ARE LOW AND CLINICALLY NEGLIGIBLE.

LATE SIDE EFFECTS ARE

- **SKIN TELANGIECTASIA >1 CM 2 ,**
- **MODERATE AND SEVERE SUBCUTANEOUS FI BROSIS,**
- **SYMPTOMATIC FAT NECROSIS**

HOW TO AVOID COMPLICATIONS

- THE RATE OF TELANGIECTASIA IS HIGHLY DEPENDENT ON THE DOSE DELIVERED TO THE SUBCUTANEOUS SMALL VESSELS BENEATH THE SKIN .
- LATE SKIN SIDE EFFECTS OCCURRED IF NOT USING ANY SKIN DOSE CONSTRAINTS OR DOSE OPTIMIZATION
- LARGER BRA CUP SIZE WAS SIGNIFI CANTLY ASSOCIATED WITH THE INCIDENCE OF FAT NECROSIS
- WITHIN THE RANGE OF SMALL- TO INTERMEDIATE- VOLUME IMPLANTS (UP TO 160 CM 3), NEITHER IMPLANT VOLUME (V100 %), VOLUME OF HIGH-DOSE REGION (V150 %, V200 %), OR DOSE INHOMOGENEITY IS ASSOCIATED WITH AN INCREASED RISK OF SUBCUTANEOUS TOXICITIES.
- HOWEVER WITH LARGE- VOLUME IMPLANTS (>160 CM 3), LARGER HIGH-DOSE REGIONS ARE CORRELATED WITH A HIGHER INCIDENCE OF FAT NECROSIS, AND THE ABSOLUTE VOLUME OF THE HIGH- DOSE REGION SEEMS TO BE ASSOCIATED WITH THE RISK OF SUBSEQUENT FAT NECROSIS
- THAT OPEN BIOPSY SHOULD BE AVOIDED WHEN POSSIBLE, AS CORE BIOPSY AND MRI ARE USEFUL FOR DIFFERENTIATING FAT NECROSIS FROM LR
- OVERALL IMPLANT VOLUME SHOULD BE LIMITED, AND MORE IMPORTANTLY THE HIGH-DOSE VOLUME (E.G., V150 % AND V200 %) SHOULD BE MINIMIZED KEEPING THE DOSE DISTRIBUTION AS HOMOGENOUS AS POSSIBLE (E.G., KEEPING THE DNR BELOW 0.30 OR DHI ABOVE 0.70)

CA BREAST

Grading	Acute toxicity	Late toxicity
G0	No change over baseline	None
G1	Follicular, faint or dull erythema, epilation, dry desquamation, decreased sweating	Slight atrophy, pigmentation change, some hair loss
G2	Tender or bright erythema, patchy moist desquamation, moderate edema	Patch atrophy, moderate, telangiectasia, total hair loss, induration
G3	Confluent, moist desquamation other than skin folds, pitting edema	Market atrophy, gross telangiectasia, fibrosis
G4	Ulceration, hemorrhage, necrosis	Ulceration or necrosis

CA PROSTATE:- COMPLICATIONS OF BRACHYTHERAPY

- PERMANENT SEED IMPLANTS-
- URINARY
  - FREQUENCY
  - OBSTRUCTIVE UROPATHY
  - INCONTINENCE
- BOWEL
  - PROCTITIS
- SEXUAL DYSFUNCTION.

URINARY COMPLICATIONS OF PROSTATE BRCHYTHERAPY

- MAJORITY OF PATIENTS WHO DEVELOP COMPLICATIONS I.E URETHRITIS WITH INCREASED URINARY FREQUENCY AND OBSTRUCTIVE AND IRRITATIVE SYMPTOMS WHICH START A FEW DAYS POST IMPLANT AND MAY PERSIST UP TO 6–9 MONTHS AFTER.
- THE SYMPTOMS FOR 90 % OF MEN RESOLVE AT 1 YEAR ONCE MOST OF THE TOTAL DOSE IS DELIVERED.
- ACUTE URINARY RETENTION HAPPENS IN 5–10 % OF PATIENTS. IT SHOULD BE MANAGED CONSERVATIVELY IN THE FIRST INSTANCE WITH ALPHA-BLOCKERS AND INTERMITTENT SELF-CATHETERIZATION OR CONTINUOUS DRAINAGE WITH A FOLEY CATHETER.
- THE PROBABILITY OF DEVELOPING ACUTE RETENTION CORRELATES WITH THE PRETREATMENT IPSS SCORE AND PROSTATE SIZE AND IS RELATED TO PRIOR USE OF ALPHA-BLOCKING DRUGS, TOBACCO USE, AND AGE .
- RETENTION NORMALLY RESOLVES WITHIN THE FIRST YEAR AND SHOULD BE TREATED CONSERVATIVELY.
- IF A TURP IS PERFORMED IN THE FIRST YEAR POST-TREATMENT, THERE IS A HIGHER RISK OF URINARY INCONTINENCE .

URINARY COMPLICATIONS OF CA PROSTATE

- CHRONIC URINARY MORBIDITY CAN OCCUR SECONDARY TO EXCESSIVE IRRADIATION OF THE BLADDER NECK OR PROSTATIC URETHRA. RTOG GRADE 3 TOXICITY IS REPORTED IN 1–3 % OF TREATED PATIENTS AND URETHRAL STRICTURE RATES ARE UP TO 12 % .

- LONGTERM INCONTINENCE IS STRONGLY ASSOCIATED WITH PREVIOUS TURP SURGERY, WITH UP TO 20 % INCONTINENCE RATES IN THE GROUP WHO UNDERWENT TURP VERSUS 1 % WITHOUT TURP IN ONE SERIES . NEWER EVIDENCE IS EMERGING WHICH MAY SUPPORT POST TURP IMPLANTATION IN SELECTED CIRCUMSTANCES.

PROCTITIS AND SEXUAL DYSFUNCTION

- CHRONIC RADIATION PROCTITIS IS RARE, SEEN IN LESS THAN 5 % OF PATIENTS.
- PRESENT 6 MONTHS POST IMPLANT WITH RECTAL BLEEDING, RECTAL URGENCY, RECTAL INCONTINENCE, AND PAIN.
- RATES OF RECTAL FISTULAS ARE LOW, AROUND 0.6 % .
- THE DISTANCE BETWEEN POSTERIOR SEEDS IMPLANTED AND THE ANTERIOR RECTAL WALL IS CORRELATED WITH RECTAL TOXICITY, AND IMPROVED TECHNOLOGY IN IMPLANT POSITIONING ACCURACY HAS IMPROVED RATES OF TOXICITY.

- ERECTILE DYSFUNCTION RATES ARE GENERALLY LOWER WITH PERMANENT SEED IMPLANTS COMPARED TO OTHER TREATMENT MODALITIES.
- THE RATE OF ERECTILE DYSFUNCTION HAS A SIGNIFI CANT CORRELATION WITH PREIMPLANT ERECTILE STATUS.
- THIRTY PERCENT OF MEN POTENT PRIOR TO THE IMPLANT WILL DEVELOP IMPOTENCE BUT 60 % WILL RESPOND TO PHOSPHODIESTERASE INHIBITORS.

	Grade 1	Grade 2	Grade 3	Grade 4
Acute genitourinary toxicity	Frequency of urination or nocturia *twice* pretreatment habit/ disuria or urgency not requiring medication	Frequency of urination is less frequent than every hour *(day:12–16 times; nocturia 5–8 times)*/ disuria, urgency, bladder spasm requiring local anaesthetic	Frequency of urination is more frequent than every hour (*day: >16 times; nocturia >8 times*)/ disuria, bladder spasm/ urgency requiring frequent regular narcotic/gross haematuria/*complaints requiring permanent or suprapubic catheter*	Haematuria requiring transfusion/obstruction not due to clots/ ulceration/necrosis
Late genitourinary toxicity	*Frequency during day 0.5 –1 h; nocturia 2–3/night; slight dysuria* or microscopic haematuria *requiring no medication*; slight epithelial atrophy, minor teleangiectasia; *bladder capacity > 300 cm^3*	*Frequency during day 1–2 h; nocturia 4–6/night; Moderate dysuria or intermittent (mild, moderate)* haematuria *requiring medication; moderate* teleangiectasia; *bladder capacity 150–300 cm^3*	*Frequency during day >2 h; nocturia >6/night; severe* dysuria/frequent *(severe)* haematuria/ *severe* teleangiectasia; bladder capacity 100 –150 cm^3; *benign urethral strictures requiring a TURP, dilatation, suprapubic or permanent catheter*	Necrosis; severe haemorrhagic cystitis; bladder capacity: < 100 cm^3

TURP = transurethral resection of the prostate.

RTOG/EORTC grade	Description
Grade 0	No symptoms
Grade 1	Mild diarrhea, mild cramping, bowel movement five times daily. Slight rectal discharge or bleeding
Grade 2	Moderate diarrhea and colic bowel movement >5 times daily Excessive rectal mucus or intermittent bleeding
Grade 3	Obstruction or bleeding requiring surgery
Grade 4	Necrosis/perforation/fistula

RTOG, Radiation Therapy Oncology Group; EORTC, European Organization for Research and Treatment of Cancer.

COMPLICATIONS OF BRACHYTHERAPY IN CA CERVIX

ACUTE AND LONG-TERM COMPLICATIONS FROM LOW DOSE RATE AND HIGH DOSE RATE BRACHYTHERAPY	
Acute	**Late**
Uterine perforation	Proctitis
Vaginal laceration	Ulceration of bladder or rectum
Fever	Fistula
Thrombotic events	Stricture
Anesthesia-related nausea	Vaginal stenosis

Table 1
Modified Radiation Therapy Oncology Group rectal toxicity scale

Grade 1	Mild and self-limiting	Minimal, infrequent bleeding or clear mucus discharge, rectal discomfort not requiring analgesics, loose stools not requiring medications
Grade 2	Managed conservatively, lifestyle (performance status) not affected	Intermittent rectal bleeding not requiring regular use of pads, erythema of rectal lining on proctoscopy, diarrhea requiring medications
Grade 3	Severe, alters patient lifestyle	Rectal bleeding requiring regular use of pads and minor surgical intervention, rectal pain requiring narcotics, rectal ulceration
Grade 4	Life threatening and disabling	Bowel obstruction, fistula formation, bleeding requiring hospitalization, surgical intervention required

CA CERVIX:- POST BRACHY COMPLICATION

- MORE COMMONLY PATIENTS MAY EXPERIENCE CHRONIC RECTAL AS A RESULT OF RADIATION PROCTOPATHY.
- IN THE ERA OF 2-DIMENSIONAL BRACHYTHERAPY, THE INCIDENCE OF MILD TO SEVERE RECTAL BLEEDING RANGED FROM 5 TO 30 % .
- SEVERE RECTAL BLEEDING:- 2 % OF PATIENTS TREATED WITH CT-BASED BRACHYTHERAPY AS COMPARED TO 13 % OF THOSE TREATED WITH CONVENTIONAL 2-DIMENSIONAL BRACHYTHERAPY PLANNING, P = 0.02 .
- FOR PATIENTS EXPERIENCING MILD TO MODERATE BLEEDING, CONSERVATIVE MANAGEMENT WITH CORTICOSTEROID, SUCRALFATE, OR MESALAMINE ENEMAS IS EFFECTIVE IN >70–80 % OF PATIENTS .
- SHOULD BLEEDING PERSIST OR INCREASE IN SEVERITY, ENDOSCOPIC EVALUATION WITH INTRARECTAL THERMAL OR PHOTOCOAGULATION IS THE MOST EFFECTIVE MEANS OF REDUCING MODERATE TO SEVERE BLEEDING .

- VAGINAL STENOSIS REMAINS A SIGNIFICANT SOURCE OF MORBIDITY WITH MOST PATIENTS (UPWARDS OF 90 %) EXPERIENCING MILD TO MODERATE VAGINAL MORBIDITY MOST COMMONLY MANIFESTED AS VAGINAL STENOSIS OR DRYNESS .
- DILATOR USE REMAINS AN IMPORTANT PART OF MITIGATING RISKS OF VAGINAL STENOSIS.

CARCINOMA CERVIX : FISTULA,POST BRACHY COMPLICATION

- WITH INCREASED ADOPTION OF IMAGE-BASED BRACHYTHERAPY, RISK OF SEVERE COMPLICATIONS REDUCED BY MORE THAN HALF THAT ARE SEEN WITH TWO- DIMENSIONAL FI LM-BASED BRACHYTHERAPY;
- UP TO 5–10 % WILL STILL EXPERIENCE SEVERE GRADE 3+ COMPLICATIONS .
- THE MOST SEVERE COMPLICATION IS RECTOVAGINAL OR VESICOVAGINAL FISTULAE

- MANAGEMENT TYPICALLY INCLUDES IMAGING (WITH CONTRAST-ENHANCED PELVIC MRI WITH WATER-BASED VAGINAL GEL REPRESENTING THE PREFERRED MODALITY) AND EXAM UNDER ANESTHESIA TO CONFIRM THE PRESENCE OF A FISTULA AND RULE OUT RECURRENT DISEASE . WHILE IT IS IMPORTANT TO CONFIRM DISEASE RECURRENCE IN THE SETTING OF FISTULAE AS THIS OFTEN DIRECTS MANAGEMENT..
- ONCE A FISTULA IS CONFIRMED, FECAL OR URINARY DIVERSION IS WARRANTED, WITH THE TYPE OF DIVERSION INDIVIDUALIZED BASED ON PATIENT PERFORMANCE STATUS, DISEASE STATUS, EXTENT OF PRIOR RADIOTHERAPY, BOWEL HEALTH, AND OTHER FACTORS. IN THE ABSENCE OF RECURRENT DISEASE, HYPERBARIC OXYGEN MAY PROMOTE FI STULA HEALING. LESS COMMONLY COMPLEX SURGICAL REPAIR MAY BE ATTEMPTED ESPECIALLY FOR VESICOVAGINAL FI STULAE; HOWEVER THE SUCCESS RATE IS SIGNIFI CANTLY REDUCED IN A PREVIOUSLY IRRADIATED FI ELD RANGING FROM 40 TO 100 % AND MUST BE BALANCED WITH INCREASING RISKS OF SURGICAL COMPLICATIONS .

TAKE HOME MESSAGE
PREVENTION IS BETTER THAN CURE

- PROPER PLACEMENT OF THE APPLICATOR /CATHETER
- UNDERSTANDING THE RADIOBIOLOGY OF ORGAN CONCERNED
- PROPER DOSE FRACTIONATION SCHEDULE
- PROPER DOSIMETRY
- ORAL AND DENTAL HYGIENE
- PER OPERATIVE AND POST OPERATIVE CARE