# Brachytherapy for Oral Cancers

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# Opportunities and challenges

- **Easily accessible for placement of needles and after-loading catheters**
- **Critical structures surround the tumour**

- **However,**
  - **Access of anatomical site**
  - **Small volume of involved structures**
  - **Close location of critical organs (from both surgical and radiotherapy point of view)**
  - **Standard basic geometry not possible**
  - **Modifications required in conventional BRT rules**
  - **Intensive post-op care**
  - **Operator dependent**

# Goal of treatment

- Radical : Brachytherapy alone
- Boost: EBRT plus Brachytherapy to boost
- Palliative: As salvage in cases irradiated before with recurrences and unfit for surgery.

# Assessment

- PRIMARY TUMOUR:
  - Exact extent of tumour
  - Estimate of treatment/implant volume prior to procedure.
  - Clinical examination in good light (EUA)
  - Submucosal spread/Depth assessment
  - Rule out other lesions in the region
  - Type of lesion: proliferative/infiltrative
    - Ulcerative/proliferative respond better
    - Well defined and hence better delineation
    - Minimal potential margin
    - Infiltrative lesions are less preferred.
  - Imaging: CT scan/ MRI

- NECK:
  - Clinical examination
    - USG neck
    - CT/MRI

# Assessment

- Feasibility for Brachytherapy:
  - Mouth opening
  - Response the EBRT, Mucositis (if boost)
  - Proximity of bones to implant site
  - Requirement of dental shields/spacers
  - Fitness for anaesthesia
  - Dental prophylaxis
    - Prevents acute and chronic dental complications
    - Pre and post treatment prophylaxis.
    - Restoration /extractionof carious teeth
    - To rule out bony erosion/involvement
    - Removal of teeth which can cause obstruction during procedure (only if critical)

# Sites

- Anterior Tongue
- Buccal Mucosa
- Lip

  - Hard palate
  - Floor of mouth

# TONGUE IMPLANT

- **Interstitial Volume implants**

- **Radical Implant**
  - **Early T1 (superficial lesions)**
  - **Depth < 4 mm**

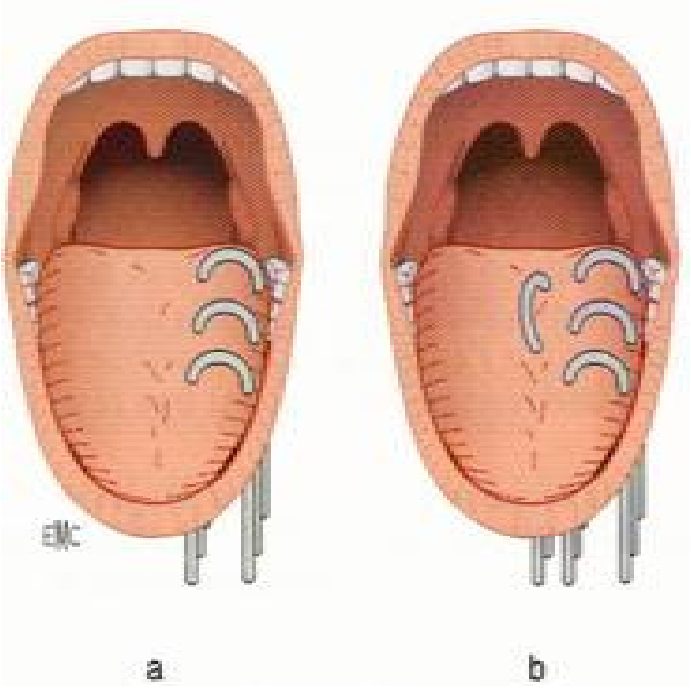
- **Boost Implant:**
  - **T1-2 N0**
  - **Approaching midline**
  - **Microscopic disease in the neck addressed by EBRT.**
  - **Risk of contralateral nodal recurrence.**
  - **Reduce EBRT dose to a large volume**

# Technique

- EVOLUTION:
  - Pre-loaded rigid radium needles (with/without template)
  - HAIR-PIN needles using Guide-gutter technique (Pierquin, Paine)
  - PLASTIC TUBE TECHNIQUE (Henschke, Hillaris)
    - Intra-oral template
    - Non-loop technique
    - Gold Button technique
    - Plastic bead technique (Bhalavat)
- Techniques refined to avoid under-dosage at the dorsum and lateral border

# LOOPS/HAIRPINS

- **PARIS SYSTEM**
- **Straight branches of the loops are parallel and not spaced too wide**
- **Height of the curved portion of loop < half of spacing**
- **Loop to form a regular semi-circle or flatter**
- **Branches of loop to be parallel for atleast the distance equal to the spacing between them.**
- **BDR calculated at a point perpendicular to the center of parallel branches**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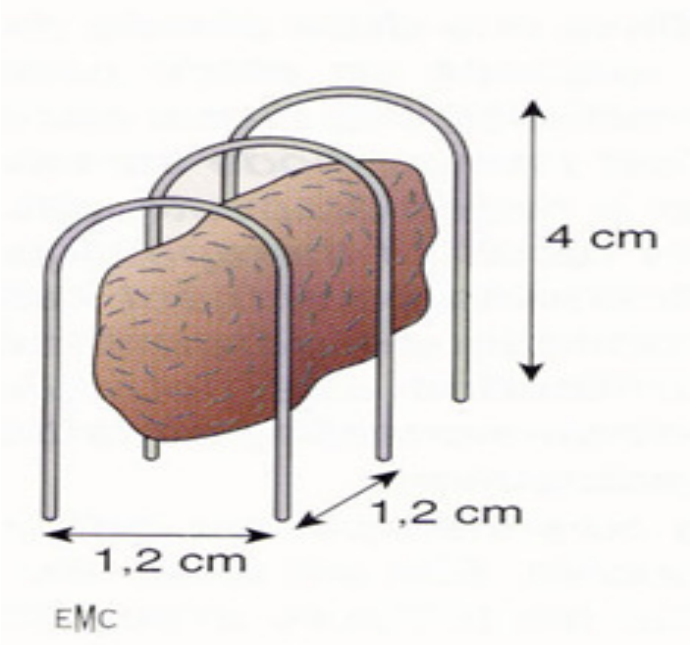

4 cm
1,2 cm
1,2 cm

# GUIDE-GUTTER

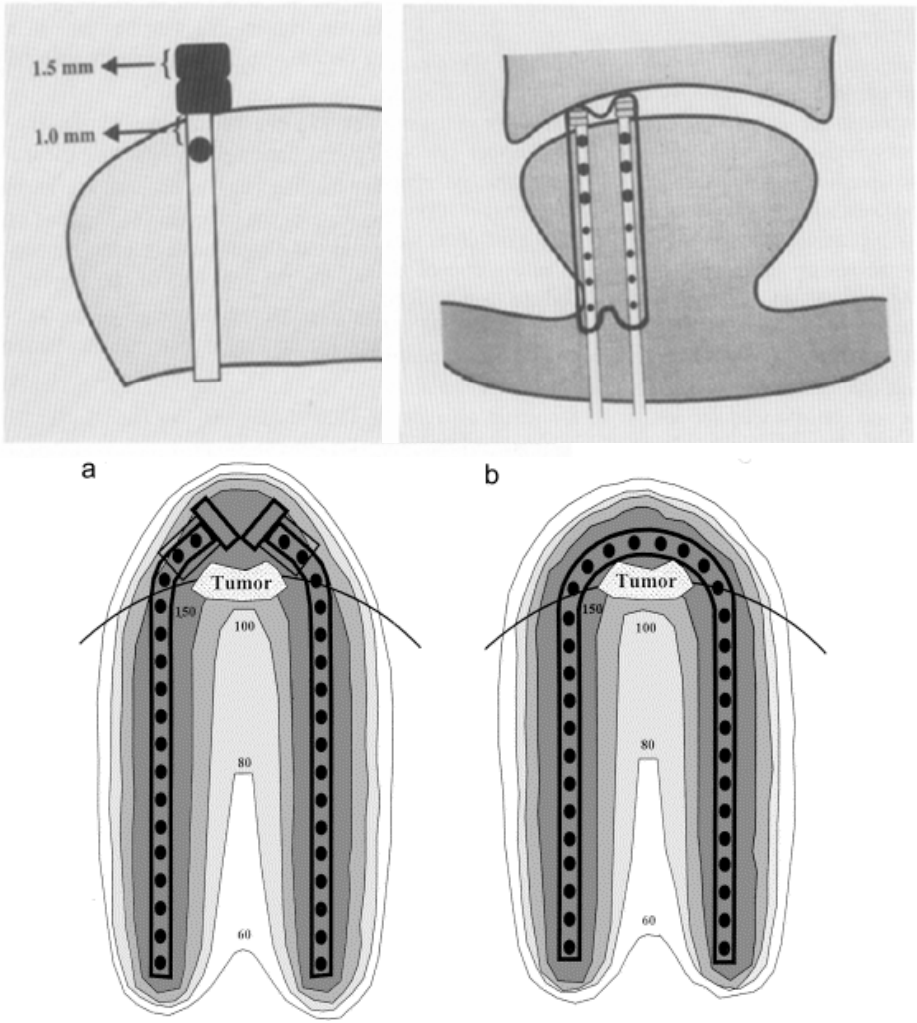
- Appropriate length guide gutters selected (u shaped)
- Posterior most inserted first just beyondthe posterior limit of the lesion.
- Anterior guide then inserted at the anterior limit.
- Additional guides can be inserted in between depending on size of lesion.
- Spacing of 1-1.4 cm maintained.
- Geometry ascertained under fluoroscopy.
- Stay sutures taken.
- Gutters replaced by active hair-pins under appropriate radioprotection.

# PLASTIC TUBE TECHNIQUE
(next presentation)

- **Afterloading technique**
- **Suitable for larger lesions**
- **Percutaneous approach**
- **Needles inserted through medial and lateral edge of the lesion.**
- **Replaced by plastic tubes which will subsequently hold radio-active source.**
- **Loop formed over the surface of tongue**
- **Maximal separation between branches < 20mm**

# NON-LOOP TECHNIQUE

- Loops can have challenges
  - Technically difficult
  - Posterior tumours
  - Source may not negotiate the sharp curve of the loop.
- Transverse catheter is eliminated
  - Button-ended catheters tied together to form an apex of functioning loop
  - Extra buttons at the dorsum for better dose



# Buccal Mucosa

- **Biology different**
  - **Low propensity for Neck nodes**
- **Favorable sites are central and anterior portions**
  - **Avoid for lesions close to RMT or the GBS**

- **Radical Implant: Early T1-2 (superficial lesions)**
- **Boost Implant: EBRT + Brachytherapy**

# Technique and Approaches

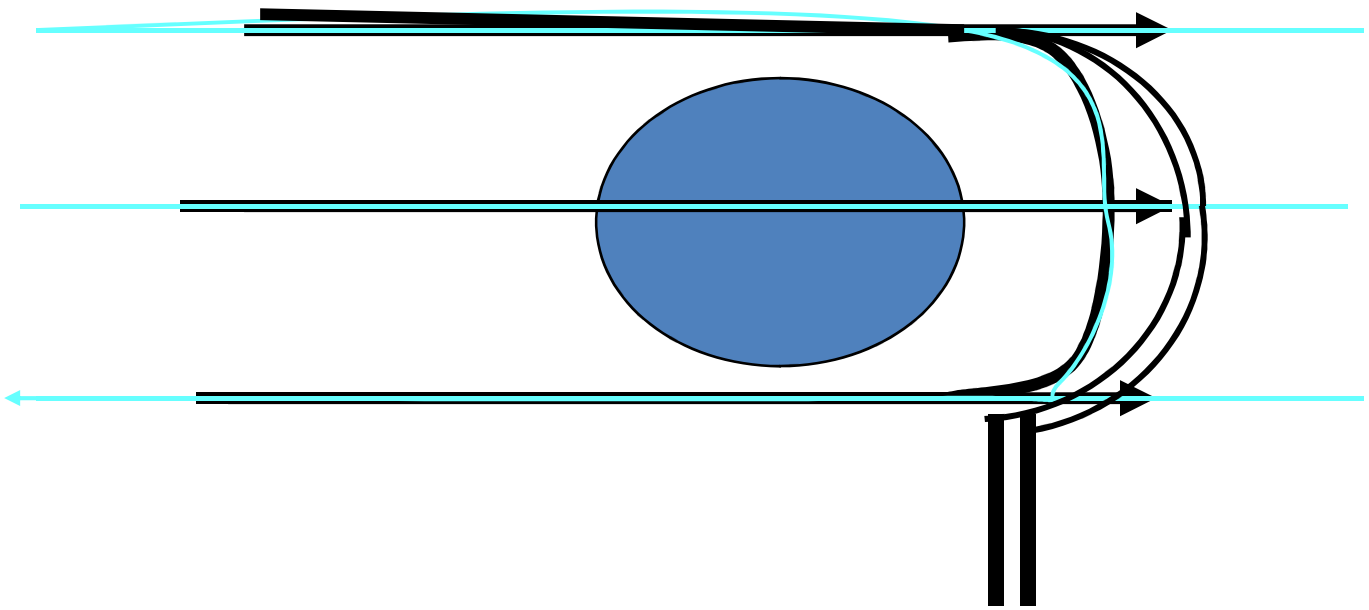
- **Transoral approach: (Uncommon)**
  - **For very small lesions without infiltration**
  - **Direct visualisation of tumour.**
- **Transcutaneous approach:**
  - **Needle inserted about 2-3 mm below the mucosa with entry and exit wounds on skin**
  - **Best suited for larger lesions with minimal infiltration (<5mm) so that larger depth is treated.**
- **Treated volume should include about 1 cm of normal appearing mucosa.**
- **Parallel needles extending beyond the margins of gross disease are usually used for complete target coverage.**

•Interstitial Planar implants.

•Single plane: tubes mid-way between mucosa and skin.

•Double plane: Submucosal + subcutaneous

•Crossing needles for coverage: anteriorly or posteriorly.



# LIP IMPLANT

- Surgery Vs Brachytherapy
- Radical Brachytherapy Vs EBRT + Boost
  - Better cosmetic outcome
  - Equivalent local control
- Choosing the right patient/tumour
  - T1-2
  - N0
  - Mid lip vs angle of mouth
  - Bone/GL Sulcus

- Standard Paris system rules to be applied
  - Single/Double plane implant
  - Plastic tube
  - Rigid needles with template

# DOSE FRACTIONATION: HDR

- **Radical: LDR equivalent of 60-70 Gy.**
- **Boost: LDR equivalent of 16-20 Gy.**

- **Various fraction sizes used in literature**
  - **Reasonable Option: 3.5-4 Gy/fraction x 2 fractions/day**
  - **Radical: 45.5 Gy/13# @ 3.5 Gy/# twice a day**

# Outcome: Literature

| AUTHOR | NºCASES | DOSE (Gy) | 5 YEARS LC | FUNCTIONAL AND ESTHÉTICS | COMPLICATIONS |
|---|---|---|---|---|---|
| Beauvois et al. (13) | 237 (T1-T4) | 65- 68 | 99% | 198 Sligth telangiectasia, 5 moderate retraction and depigmentation. | 11% ulceratión, 0.5% necrosis |
| Farrús et al. (12) | 72 (T1-T3) | 62-67 | 85% | - | - |
| Finestres (21) HDR | 56 (T1-T3) | 60-70 1.8 Gy/day, 5 days / week | 96,5% mean follow-up: 46 months | Good and excelent 94%, Moderate 6% | 4 ulceration 4 hyperpigmentation 2 telagiectasia 2 fibrosis |
| Fongione et al. (14) | 69 (T1-T3) | 65 | 99% | - | - |
| Gerbaulet et al. (22) | 231 (T1-T3) | Mean of 76 Gy | 95% | Good 70%, moderate 16%, poor 4% | 13% necrosis (T3) |
| Guinot et al. (20) HDR | 39 (T1-T4) | 40.5-45, 8-10 fx,2 fx / day , 6 hours. interval | 87% | Similar to LDR | Similar to LDR |
| Mazeron et al. (9) | 1870(T1-T3) | 60-70 | T1 98.4%, T2 96.6%, T3 89.9% | Normal: T1 82%, T2 51%, T3 27%. Acceptable:T1 17%, T2 44%, T3 64% Unfavorable: T1 1%, T2 5%, T3 9% | - |
| Petrovich et al. (23) | 91 (T1-T3) | 7000 rads | 95,5% | - | 4 % necrosis 11% pigmentation 1% localized edema 5% slight retraction |

# Clinical course

- During the first 3 weeks after treatment a progressive mucositis appears in the treated area
- Usually resolves in 4-6 weeks.
- The treatment is based on topical analgesics / anti-Inflammatory.
- Lesion/induration disappears in 2 months after brachytherapy
- 4-6 months Follow up:
  - Scarring in the area
  - Cosmetic outcome depends on the initial size and tissue loss
  - Hypopigmentation: If skin involved