Intraluminal Brachytherapy:

Oesophagus

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The Problem of Cancer Esophagus in India

Amongst the 5 most common cancers registered at TMH

Total No of cases: 15591  
Males: 8822  
Females: 6769

Cancer Esophagus: 741 (4.7%)  
Males: 504  
Females: 231

TMH cancer registry 2000
Age Distribution

Avg. Age = 57.0 Yrs

**Female**

- 19.2
- 18.4
- 13.7
- 11.8
- 5.1
- 5.1
- 1.6
- 0.8
- 0.0
- 0.0

**Male**

- 75+
- 70 - 74
- 65 - 69
- 60 - 64
- 55 - 59
- 50 - 54
- 45 - 49
- 40 - 44
- 35 - 39
- 30 - 34
- 25 - 29
- 20 - 24
- 15 - 19

Gender Distribution: M : F 1.9 : 1

Percentage

0.0 2.7 8.1 19.3 14.9 13.7 15.1 19.3 9.7 0.2 0.6 0.6 0.2
Clinical Extent of Disease

- Localised: 20.7%
- Regional: 44.5%
- Advanced: 38.4%

- Total: 508
  - Female: 175
  - Male: 333
Management of Esophageal Cancer

Patients with Esophageal cancer

Staging

Resectable disease

T4 disease
TOF/unresectable

Metastatic disease

R0 resection improbable

Palliation

R0 resection possible

Risk Assessment

Good Risk

Radical Resection

Study protocol

Poor risk

Definitive chemoradiation

NACT/NACT+RT

R0 resection improbable

Good response

Poor Response

Palliation

Risk assessment
Role of Intraluminal Radiotherapy

- **Definitive**
  - Boost – consolidate response of external RT
  - Limits dose to critical structures
  - Dose escalation to primary
  - Limited role in this setting with the use of CT/RT protocols

- **Palliation**
  - As a Sole Modality With External RT
  - Dysphagia relief – symptom free survival
  - Relieves dysphagia and improves swallowing status.
  - Short treatment
  - Very rapid relief (vs. external RT)
  - Relieves bleeding/pain (better than external RT)
  - Limits the dose to critical structures.
  - Balance between potential benefits vs. potential risks
Selection Criteria For Brachytherapy in Esophagus

**Good Candidates**
1. Primary tumor <10 cm in length.
2. Tumor confined to esophageal wall.
3. Thoracic esophagus location.
4. No regional lymph node or systemic metastases.

**Poor Candidates**
1. Extraesophageal extension.
2. Tumor >10 cm in length.
3. Regional lymphadenopathy.
4. Tumors involving GE junction or cardia.

**Contraindications**
1. Tracheo-esophageal fistula/ deep ulcerative lesion.
2. Stenosis which cannot be bypassed.
Is ILRT Required in Radical Setting After EBRT?

50 untreated cases of squamous cell cancers of middle 1/3rd Esophagus, KPS>70

All patients received 35Gy/15# EBRT

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>ARM</th>
<th>Relief of Dysphagia (1 year)</th>
<th>Local Control 1yr</th>
<th>Overall Survival 1yr</th>
<th>strictures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>25</td>
<td>20Gy/10# EBRT</td>
<td>37.6%</td>
<td>25%</td>
<td>44%</td>
<td>4%</td>
</tr>
<tr>
<td>Group B</td>
<td>25</td>
<td>6GyX2# HDR</td>
<td>70% P=NS</td>
<td>70% P=NS</td>
<td>*78% P=sign.</td>
<td>8%</td>
</tr>
</tbody>
</table>

Sur et al IJROBP 1992
186 untreated patients of squamous cell carcinoma, tumor length < 7cm
All patients received 50Gy/25# of EBRT.

Is ILRT Required in Radical Setting After EBRT?

Yin et al Brachytherapy 1991
Does Chemotherapy Add to The Benefit?

A PHASE I/II STUDY OF EXTERNAL BEAM RADIATION, BRACHYTHERAPY AND CONCURRENT CHEMOTHERAPY IN LOCALIZED CANCER OF THE ESOPHAGUS (RTOG 92-07): PRELIMINARY TOXICITY REPORT

Laurie E. Gaspar, M.D.,* Chunlin Qian, Ph.D.,† Walter I. Kocha, M.D.,‡ Lawrence R. Coia, M.D.,§ Arnold Herskovic, M.D.,‖ and Mary Graham¶

Total 50 patients with curative intent

Received 50Gy/25# EBRT with concurrent cisplatin +5FU

15Gy/3# HDR ILRT concurrently with 3rd cycle chemotherapy

Only 70% patients could complete EBRT, 3rd # of HDR abandoned in most pts.

1yr survival rate- 48% not different from CT+RT data from RTOG 85-01.

<table>
<thead>
<tr>
<th>Life-threatening</th>
<th>Fatal</th>
<th>All (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper aerodigestive tract excluding fistulas*</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Fistula</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Gastrointestinal tract ‡</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hematologic §</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Infection</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Skin $</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Renal</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

34% Life Threatening toxicities
CARCINOMA OESOPHAGUS
EXTERNAL RT +/- 5FU + ILRT (LDR)
DYSPHAGIA FREE SURVIVAL [1988 -1996]

% SURVIVAL

MONTHS

P = 0.04

15Gy@200cGy/hr (1994-96)
15Gy@300cGy/hr (1991-93)
25Gy@300cGy/hr (1988-89)
20Gy@300cGy/hr (1990-91)

Vinay Sharma et al Dis Oeso 2000
## Treatment Complications

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Stricture</th>
<th>Ulcerations</th>
<th>T.O.F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ILRT - LDR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 25 Gy@ 200 cGy/hr</td>
<td>30%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>+/- 5FU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 20 Gy@ 300 cGy/hr + 5 FU</td>
<td>24%</td>
<td>30%</td>
<td>12%</td>
</tr>
<tr>
<td>- 15 Gy@ 300 cGy/hr + 5FU</td>
<td>08%</td>
<td>28%</td>
<td>12%</td>
</tr>
<tr>
<td>- 15 Gy@ 200 cGy/hr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+/- 5FU</td>
<td>33%</td>
<td>22%</td>
<td>--</td>
</tr>
</tbody>
</table>

Vinay Sharma et al Dis Oeso 200
Schedule for Definitive Radiotherapy And Brachytherapy in Radical Setting

External beam radiation:
- 45–50 Gy in 1.8–2.0-Gy fractions, five fractions/week, weeks 1–5

Brachytherapy
- HDR—total dose of 10 Gy, 5 Gy/fraction, one fraction/week, starting 2–3 weeks following completion of external beam
- LDR—total dose of 20 Gy, single course, 0.4–1.0 Gy/hr, starting 2–3 weeks from completion of external beam

* All doses specified 1 cm from midsource or mid-dwell position.

ABS Recommendations

TMH- Post 50Gy of EBRT- 12Gy/2#HDR weekly (6GyX2)
Conclusion (ILRT in definitive setting)

1. ILRT has a definitive role as a boost after EBRT.

2. ILRT improves dysphagia relief, local control and overall survival with some additional toxicity.

3. Chemotherapy does not add to the benefit gained by the combination.

4. Chemotherapy significantly adds up to toxicity if given to patients receiving a combination of EBRT and ILRT.

5. Concurrent administration of chemotherapy with ILRT should be avoided.
Modalities available for palliative therapy

Surgery
Intubation (Self Expanding Metal Stents ‘SEMS’ and semi-rigid prosthetic tubes)
Thermal Ablation
   (a) Laser therapy (Nd-YAG or Diode)
   (b) BICAP probe
   (c) Argon Plasma Coagulation
Photodynamic Therapy
Radiotherapy (External beam radiation therapy and brachytherapy)
Chemotherapy
Dilatation
Chemical Injection therapy
Enteral feeding (nasogastric tube, PEG)

PEG: percutaneous endoscopic gastrostomy.
<table>
<thead>
<tr>
<th>Method</th>
<th>Median survival (mo)</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBRT</td>
<td>5</td>
<td>Rider et al</td>
</tr>
<tr>
<td>Bypass Sx</td>
<td>5</td>
<td>Mannell et al</td>
</tr>
<tr>
<td>Laser</td>
<td>4</td>
<td>Seagalin et al</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>4</td>
<td>Kelsen et al</td>
</tr>
<tr>
<td>Intubation</td>
<td>2.5</td>
<td>Mannell et al</td>
</tr>
<tr>
<td>Fractionated Brachytherapy</td>
<td>6-9</td>
<td>Sur et al</td>
</tr>
</tbody>
</table>
Single-dose Brachytherapy vs. Metal Stent For Palliation

Total no of patients 209
Stent placement (n=108)
Brachytherapy (n=101)
Brachytherapy dose –single dose 12Gy

Results

• Long-term Dysphagia relief better (115 vs. 82 days, P=0.015)
• Better Quality of life
• Lesser complications 21%vs 33% (p=0.02)
• No difference in median survival

Homs et al Lancet 2004
**TMH Experience**

**PALLIATION OF ADVANCED/RECURRENT ESOPHAGEAL CARCINOMA WITH HIGH-DOSE-RATE BRAHY THERAPY**

Vinay Sharma, M.D.,* Umesh Mahantshetty, M.D., D.N.B. (R.T.),* Ketayun A. Dinsliaw, D.M.R.T. (Lond.), F.R.C.R. (Lond.),* Raman Desiipande, M.S.,† and Sanjay Sharma, M.S.†

<table>
<thead>
<tr>
<th>Stricture-9</th>
<th>Ulcerations- 6</th>
<th>Fistula - 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol- HDR 6GyX2# 1 week apart</td>
<td>N=58</td>
<td></td>
</tr>
</tbody>
</table>

| No of patients | 58 |
| Male:female    | 37:21 |
| Age group      | 32–88 years (mean 64 years) |
| Previously untreated cases | 37 |
| Old age and KPS <50% | 29 |
| Second primary tumors | 4 |
| Distant metastasis | 4 |
| Post-treatment recurrent cases | 21 |
| Post-RT recurrence | 15 |
| Post-surgery recurrence | 5 |
| Post-CT/prosthesis | 1 |
| Site of lesion | No (%) |
| Upper third | 10 (17%) |
| Mid third | 38 (66%) |
| Lower third \(\leq\) c.o junc. | 10 (17%) |

<table>
<thead>
<tr>
<th>Lesion length (cm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>14 (24%)</td>
</tr>
<tr>
<td>5–10</td>
<td>39 (67%)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>05 (9%)</td>
</tr>
</tbody>
</table>

**Dysphagia relief and Survival**

Sharma V et al IJROBP 2002
# Palliation of Dysphagia by Radiotherapy +/- Chemotherapy

<table>
<thead>
<tr>
<th>Series</th>
<th>Total No. Patients</th>
<th>At the End of Treatment (%)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Radiation therapy alone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wara et al.</td>
<td>103</td>
<td>89</td>
<td>6-mo average</td>
</tr>
<tr>
<td>Petrovich et al.</td>
<td>133</td>
<td>87</td>
<td>34% ? 6 mo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18% ? 3 mo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35% ? 3 mo</td>
</tr>
<tr>
<td>Roussel et al.</td>
<td>69</td>
<td>70</td>
<td>—</td>
</tr>
<tr>
<td>Caspers et al</td>
<td>127</td>
<td>71</td>
<td>54% until death</td>
</tr>
<tr>
<td>Whittington et al</td>
<td>25</td>
<td>—</td>
<td>5% at 9 mo</td>
</tr>
<tr>
<td><strong>Combined modality therapy (Radiation + chemotherapy)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coia et al.</td>
<td>102</td>
<td>88</td>
<td>67–100% until death</td>
</tr>
<tr>
<td>Seitz et al</td>
<td>35</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>Whittington et al</td>
<td>26</td>
<td>—</td>
<td>87% 3-y actuarial</td>
</tr>
<tr>
<td>Algan et al</td>
<td>8</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>Gill et al</td>
<td>71</td>
<td>60</td>
<td>—</td>
</tr>
<tr>
<td>Urba and Turris</td>
<td>27</td>
<td>—</td>
<td>59% until death</td>
</tr>
<tr>
<td>Izquierdo et al</td>
<td>25</td>
<td>64</td>
<td>Median, 5 mo</td>
</tr>
</tbody>
</table>
Cost Effectiveness of Palliative Modalities

Primary Cost of Treatment

Cost of survival per month after treatment

Technique

1. Blind insertion
2. Fluoroscopy assisted

Recommended external diameter of the applicator- 0.6-1cm.
Narrower catheters deliver more to mucosa.
Large catheters – more risk of abrasions/perforations.
Pre Treatment
Localisation
ILRT Tube in situ, localization
ILRT Tube in situ, localization
**Brachytherapy Dose Fractionation**

**Target Volume** – Visible Mucosal tumor with 2cm craniocaudal margin.

**Dose Prescription** – 1 cm from mid-source or mid dwell position without optimization.

Several doses and fractionations have been used and ideal not known.

**HDR/MDR/LDR**

**Single dose/Fractionated radiotherapy.**

10Gy/15Gy-single dose as per previous external RT/ tolerance/life expectancy.
Fractionated 6GyX2#, 6GyX3#, 8GyX2#, etc. ------- HDR. [10-14Gyin 1-2#-ABS]

20Gy single course at 0.4-1Gy/1h------ LDR. [ABS]
Prescription

UNOPT

OPT
# Dose/Fractionation (Palliation)

## Review of Literature

<table>
<thead>
<tr>
<th>Author (Ref.)</th>
<th>No. of Pts.</th>
<th>Dose</th>
<th>HDR</th>
<th>Dysphagia relief</th>
<th>Survival</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sur <em>et al.</em> (28)</td>
<td>9</td>
<td>12 Gy/2 fr</td>
<td>HDR</td>
<td>3/9 pts: 9 months</td>
<td>9 months</td>
<td>4 Stricture, 2 Failure</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>20 Gy/3 fr</td>
<td>MDR</td>
<td>5.1 months mean</td>
<td>4 months</td>
<td>3 Esophagitis</td>
</tr>
<tr>
<td>Harvey <em>et al.</em> (13)</td>
<td>12</td>
<td>12.5 Gy/1 fr</td>
<td>HDR</td>
<td>4.5 months mean</td>
<td>5.8 months</td>
<td>9 Esophagitis</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>15 Gy/1 fr</td>
<td>MDR</td>
<td>67%, 5 mths</td>
<td>5.5 month mean</td>
<td>5 Fistulas</td>
</tr>
<tr>
<td>Jager <em>et al.</em> (26)</td>
<td>37</td>
<td>15 Gy/1 fr</td>
<td>HDR</td>
<td>median</td>
<td>20%, 12 months</td>
<td>1 Hematemesis, 2 Ulceration</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>15 Gy/1 fr</td>
<td>HDR</td>
<td>6 months</td>
<td>NR</td>
<td>1 Stricture</td>
</tr>
<tr>
<td>Kulhavy <em>et al.</em> (15)</td>
<td>11</td>
<td>18 Gy/1 fr</td>
<td>HDR</td>
<td>8 months</td>
<td></td>
<td>3 Stricture, 1 Fistulas</td>
</tr>
<tr>
<td><strong>TMH</strong></td>
<td>35</td>
<td>12 Gy/2 fr</td>
<td>HDR</td>
<td>10.8%, 12 months</td>
<td>9.8%, 12 months</td>
<td>5 Stricture, 7 fistulas</td>
</tr>
<tr>
<td><strong>Sur <em>et al.</em> (24)</strong></td>
<td>60</td>
<td>16 Gy/2 fr</td>
<td>HDR</td>
<td>25.4%</td>
<td>22.4%, 12 months</td>
<td>15 Stricture, 2 fistulas</td>
</tr>
<tr>
<td><strong>Present Series</strong></td>
<td>55</td>
<td>18 Gy/3 fr</td>
<td>HDR</td>
<td>38.9%</td>
<td>35.3%, 12 months</td>
<td>23 Stricture, 6 fistulas</td>
</tr>
<tr>
<td>Previously untreated</td>
<td>37</td>
<td>12 Gy/2 fr/1 wk apart</td>
<td>HDR</td>
<td>31/37 (80%) Median 7.8 months</td>
<td>7.8 months (median)</td>
<td>4 Stricture, 3 Ulceration, 3 Fistulas</td>
</tr>
<tr>
<td>Post Rx recurrence</td>
<td>21</td>
<td>15/21 (70%) Median 10 months</td>
<td></td>
<td></td>
<td>5 Stricture (post-RT), 4 Fistulas, 3 Ulceration (post-RT)</td>
<td></td>
</tr>
</tbody>
</table>
Dose/Fractionation (Palliation)

FRACTIONATED HIGH DOSE RATE INTRALUMINAL BRACHYTHERAPY IN PALLIATION OF ADVANCED ESOPHAGEAL CANCER

RANJAN K. SUR, M.D., D.N.B.,* BERNARD DONDE, M.MED,† VICTOR C. LEVIN, B.Sc, F.F.RAD,† AND AYLWYN MANNELL, M.S., F.R.C.S., F.R.A.C.S.‡

<table>
<thead>
<tr>
<th>Group</th>
<th>Protocol</th>
<th>Stage</th>
<th>III</th>
<th>IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12 Gy/2 fractions; 6 Gy/fraction</td>
<td></td>
<td>30</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>B</td>
<td>16 Gy/2 fractions; 8 Gy/fraction</td>
<td></td>
<td>56</td>
<td>12</td>
<td>68</td>
</tr>
<tr>
<td>C</td>
<td>18 Gy/3 fractions; 6 Gy/fraction</td>
<td></td>
<td>66</td>
<td>2</td>
<td>68</td>
</tr>
</tbody>
</table>

N= 182 patients
Advanced esophageal cancer

Preliminary analysis (6 mo) showed – Arm A fared worst- so discontinued

Dysphagia free survival

Complications

<table>
<thead>
<tr>
<th>Group</th>
<th>Strictures</th>
<th>Total patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>C</td>
<td>23</td>
<td>55</td>
</tr>
</tbody>
</table>

p = 0.014; A vs. B = 0.217; A vs. C = 0.006; B vs. C = 0.055.

IJROBP 1998: 40(2);447-453
N=232 patients, multi-institutional study
Advanced esophageal cancer.
Randomized between 6GyX3 and 8GyX2
Conclusions
2. Results better than other available modalities- overall survival- 7.9 months.
3. Brachytherapy schedules equivalent in terms of outcomes and toxicities.

Does addition of Ext. RT increase the benefit?
Randomized prospective study comparing high-dose-rate intraluminal brachytherapy (HDRILBT) alone with HDRILBT and external beam radiotherapy in the palliation of advanced esophageal cancer

Ranjan Sur¹,²,*; Bernard Donde²; Conrad Falkson¹; Sheikh Nisar Ahmed²; Victor Levin³; Subir Nag⁴; Raimond Wong¹; Glenn Jones¹

60 patients

16Gy/2# HDR- randomized to observation vs. 30Gy/10# EBRT

Addition of EBRT does not led to significant improvement in DFS, OS

Rates of complications were comparable

R Sur et al Brachytherapy 2004
Does addition of Ext. RT increase the benefit? (Palliative Setting)

Palliation Of Advanced Esophageal Carcinoma

Intraluminal Brachytherapy

Intraluminal Brachytherapy with External Radiotherapy

IAEA Multi-institutional Phase III Randomized trial.
Primary Objective:
Determine if addition of EBRT to HDR improves Freedom from dysphagia Survival

Secondary Objective:
• Determine if addition of EBRT to HDR improves Dysphagia, Odynophagia Regurgitation Pain

• Determine if addition of EBRT to HDR improves Overall quality of life.
**Study Design**

Suitable Patient

```
RANDOMIZE
```

- **ILRT alone**
  - ILRT: 8Gy x 2 fr, 1 week apart

- **ILRT + EBRT**
  - ILRT same as above
  - EBRT 30Gy/10fr, within 2 weeks of 1st ILRT

Total patients- 219

Patients treated at TMH- 29

IAEA CRP No:E33021
PRE-TREATMENT STATUS
Response

POST ILRT RESPONSE

POST ILRT+ EBRT FILM (6 weeks)
Phase III randomised trial

Adding external beam to intra-luminal brachytherapy improves palliation in obstructive squamous cell oesophageal cancer: A prospective multi-centre randomized trial of the International Atomic Energy Agency

Eduardo Rosenblatt a,*, Glenn Jones b, Ranjan K. Sur c,d, Bernard Donde e, Joao V. Salvajoli f, Sarbani Ghosh-Laskar g, Ana Frobe h, Ahmed Suleiman i, Zefen Xiao j, Subir Nag k

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Results: Median follow-up was 197 days, with a median OS of 188 days and an 18% survival rate at 1 year. DRE was significantly improved with combined therapy, for an absolute benefit of +18% at 200 days from randomization (p = 0.019). In longitudinal regression analyses, scores for dysphagia (p = 0.00005), odynophagia (p = 0.006), regurgitation (p = 0.00005), chest pain (p = 0.0038) and performance status (p = 0.0015) were all significantly improved. In contrast, weight, toxicities and overall survival were not different between study arms.

Conclusion: Symptom improvement occurs with the addition of EBRT to standard HDRBT. The combination is well tolerated and relatively safe.
Survival, 173 deaths / 219 patients

Overall survival by study arm

Occurrence of significant events. The numbers in the table represent events. Some patients had more than one type of event.

<table>
<thead>
<tr>
<th>Event</th>
<th>Whole group N = 219</th>
<th>HDBT group N = 109</th>
<th>HDBT + EBRT group N = 110</th>
<th>2-Tailed p-value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perforation</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>0.62</td>
</tr>
<tr>
<td>Stricture</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>0.21</td>
</tr>
<tr>
<td>Stent</td>
<td>11</td>
<td>3</td>
<td>8</td>
<td>0.22</td>
</tr>
<tr>
<td>Dilatation</td>
<td>28</td>
<td>13</td>
<td>15</td>
<td>0.84</td>
</tr>
<tr>
<td>Fistulae</td>
<td>19</td>
<td>7</td>
<td>12</td>
<td>0.34</td>
</tr>
<tr>
<td>Second-line EBRT</td>
<td>21</td>
<td>21</td>
<td>0</td>
<td>n/a</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
</tr>
</tbody>
</table>

HDBT: High dose-rate brachytherapy.
EBRT: External Beam Radiation Therapy.
Causes of death

LOCAL FAILURE 113/128 LF died

99 cases LF without DF

1 1 Cases LF and DF

3 ‘Other’ with some LF

DISTANT FAILURE 19/26 DF died

8 cases DF without LF
Optimal EBRT dose/fractionation is unknown specially in limited resource settings and future trials are expected to answer those questions.

**Purpose**

To determine if a shorter regime of EBRT (20Gy/5#) is not inferior in the palliation of dysphagia than a more protracted course of EBRT (30Gy/10#), both in combination with ILRT (8Gy/2#)
Study Design

Suitable Patient
1st Insertion of ILRT completed successfully
Stratified by Centre, M0/M+

RANDOMIZE

1# ILRT + 30Gy/ 10#
1# ILRT + 20Gy/ 5#

ILRT: 8Gy x 2 fr, 2-7 days apart

EBRT: within 3 – 14 days of 1st ILRT

Sample Size: 266
Time Period of Study: 3.5 years

IAEA CRP No:E33021
Study end-points

**Primary Objective:**
• Determine that 20Gy/ 5# is not inferior to 30Gy/ 10# for the outcome of dysphagia score, following 2 insertions of ILRT

**Secondary Objective:**
• Determine any difference in odynophagia, regurgitation, weight and performance status
• Determine any difference in overall toxicity, chest pain and Survival
• Validate the TMH – QOL questionnaire by comparing to EORTC QLQ-C30, KPS and PPSv2
Timing of Brachytherapy

Whenever given in combination with external radiotherapy-sequencing important.

Brachytherapy → 2-3 weeks → External Radiotherapy

External Radiotherapy → 2-3 weeks → Brachytherapy

Preferrable approach

Keyes* et al-

- Brachytherapy after EBRT yielded a higher rate of pathologically negative specimens compared to vice versa. (51% vs. 38%)

Complications

Depends on

1. Length of lesion treated
2. The type of initial lesion
3. Radiotherapy dose if given
4. Chemotherapy, type and timing if given
5. Type of applicator

<table>
<thead>
<tr>
<th>Type</th>
<th>Stricture</th>
<th>Fistula</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILRT</td>
<td>4-10%</td>
<td>4%</td>
</tr>
<tr>
<td>ILRT+EBRT</td>
<td>10-15%</td>
<td>6-8%</td>
</tr>
<tr>
<td>ILRT+EBRT +CHEMO</td>
<td>20-50% (depending on timing of chemo)</td>
<td>8-18%</td>
</tr>
</tbody>
</table>

Median time -3.9mo (attributable to treatment)
Supportive Care

- IV hydration
- Gastrostomy/ Jejunostomy feeding encouraged.
- Nutritional support if caloric intake is poor.
- Antifungals/ gargles as and when required.
- Sucralfate/ local anesthetics
- Dilatations if required.
THANK YOU