Intraluminal Brachytherapy for Cancer Nasopharynx

Rationale For Brachytherapy In Nasopharynx

- Good local control is achieved with Radiotherapy or RT+ Chemotherapy.
- Higher the dose higher the local control. [Good Dose Response Relation]

  [Vikram et al, Marks et al]
- Several techniques have been tried- Transpalatal interstitial implantation

  Several endocavitory applicator based tech.
- NPx is secluded, midline surrounded by bones, vessels and nerves

  - hence endocavitory procedure most suitable.

Indications

1. Boost for persistent disease after radiotherapy or chemoradiotherapy.

   T1, T2a tumors

   T2b tumors with good response
2. Recurrent cases

Suitable Candidate

1. Tumors restricted to Nasopharynx

   with no involvement of nasal cavity or oropharynx

2. Thickness of CTV <10 mm-

   superficial tumors/ Tx that have shrunk significantly

   well circumscribed, superficial local recurrences.

A new applicator design for endocavitary brachytherapy of cancer in the nasopharynx

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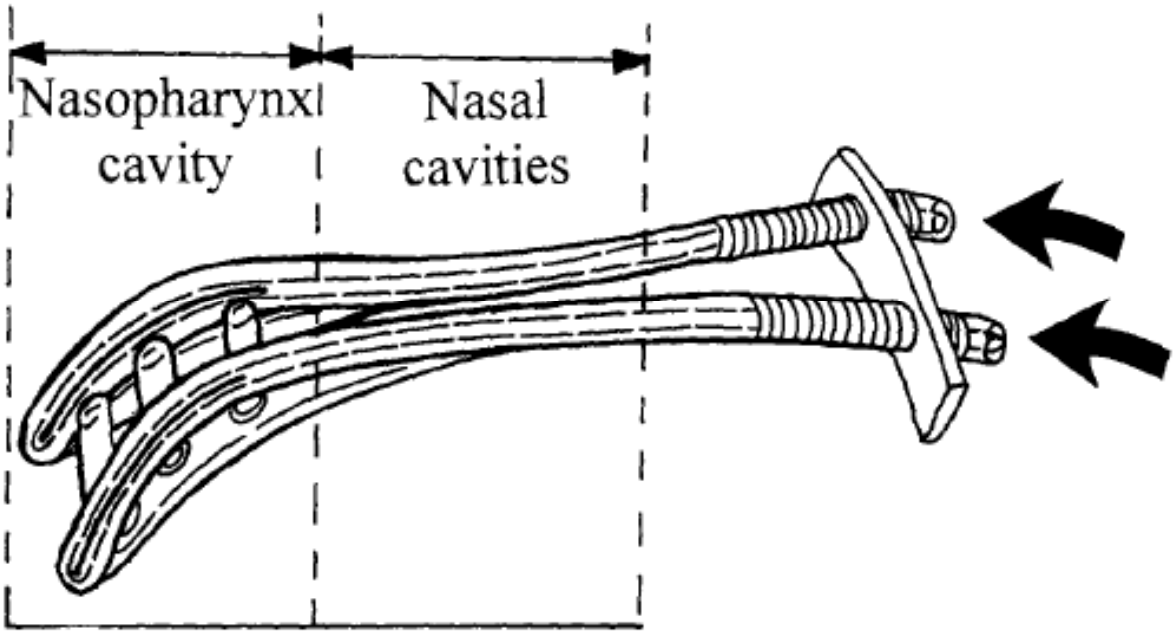
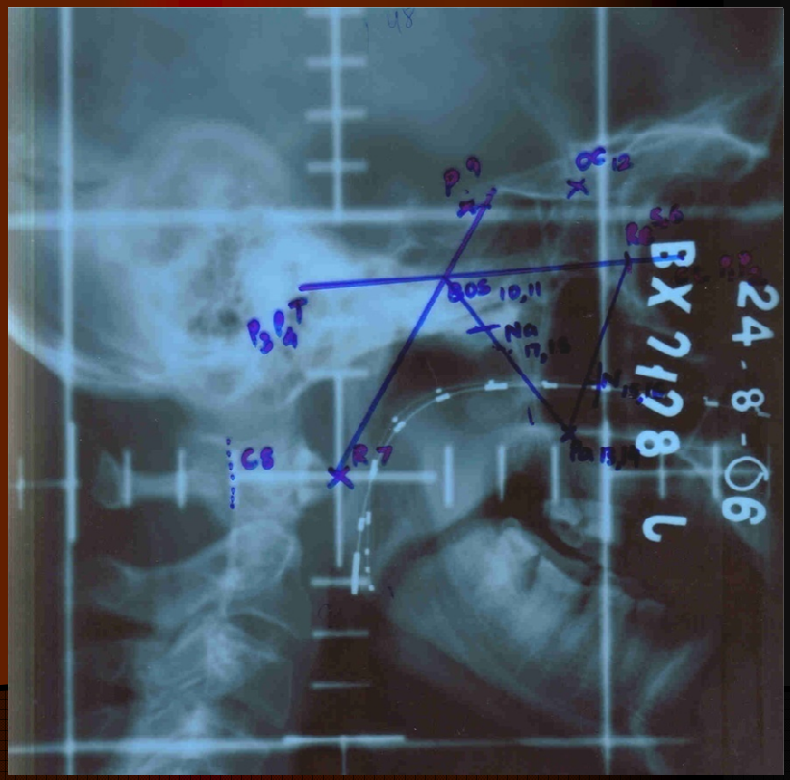


Levendag et al Radiother Oncol 1997

Treatment Planning

- Treatment planning based on orthogonal radiographs
- Patient positions representing target and critical structures are depicted on lateral and AP simulation film.
- Obtained dose distribution is optimized such that
- Target receives a dose of 3Gy(reference dose)
- Normal tissue points receive a dose as low as reasonably achievable.

1. Nasopharynx point
2. Base of skull point
3. Node of Rouviere point
4. Optic chiasm
5. Retina
6. Pituitary
7. Spinal cord

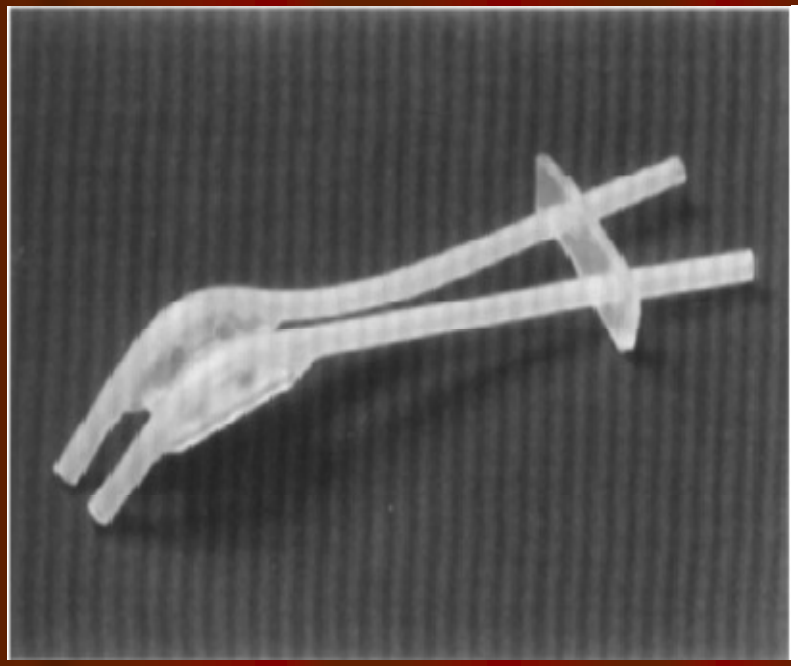


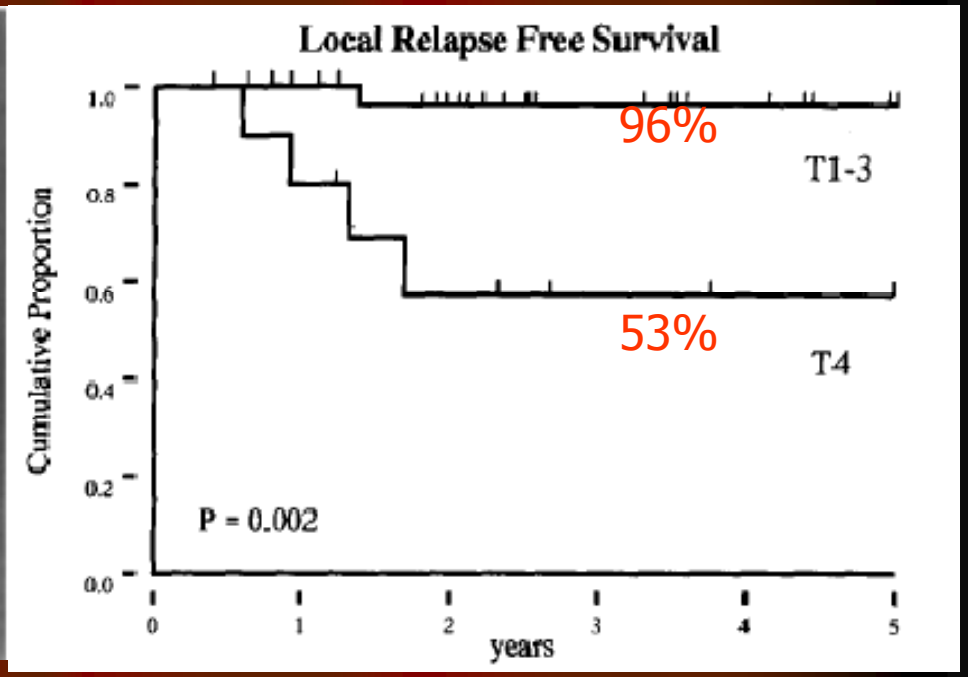
Peter Levendag et al.[Radiotherapy Oncol 1997]

Protocol followed

T1,T3 -60Gy/30# EBRT, 3GyX6# HDR (2#/day, 6hrs apart)

T4- 70Gy/35# EBRT, 3GyX4# HDR (2#/day, 6hrs apart).





Levendag et al Radiother Oncol 1997

Wang et al [Massachusetts General Hospital 25 years Experience]

5 acturial survival rates after RT related to Boost technique at MGH

N	*Local Control Rate (%)*	*Disease-Specific*	*Survival Rate (%)*
T1—2			
Brachytherapy	92	82	78
No brachytherapy	56	53	43
		$p = 0.0001$	$p = 0.0001$
T3			
Brachytherapy	20	74	74
No brachytherapy	26	60	46
		$p = 0.25$	$p = 0.08$
T1-3			
Brachytherapy	112	81	78
No brachytherapy	82	56	44
		$p = 0.0001$	$p = 0.0001$

	n	*Local Control Rate (%)*	*Disease-Specific Survival Rate (%)*
1950-1994	38	40	59
Dose			
≥60 Gy	30	52	55
<60 Gy	8	21	71
		$p = 0.31$	$p = 0.33$

5 year acturial rates after Re-irradiation for Recurrent NPC

Wang et al Wiley Liss 1997

Managing nasopharyngeal carcinoma with intracavitary brachytherapy: one institution's 45-year experience

Nancy Lee*, Rex Hoffman, Theodore L. Phillips, Ping Xia, Jeanne M. Quivey, Vivian Weinberg, I-Chow J. Hsu

Overall treatment outcome

Variable	Primary disease (n = 43)	Recurrent disease (n = 12)
Follow-up (months)		
Median	36	50
Range	1–278	6–204
Local control		
3-year estimated	94%	75%
5-year estimated	89%	64%
Failed	6	4
Distant metastasis–free rate		
3-year estimated	79%	100%
5-year estimated	75%	100%
Failed	9	2
Overall survival		
3-year estimated	90%	91%
5-year estimated	86%	91%
Died	9	2

55 patients received ILBT

EBRT dose-54-72Gy-primary

30-42Gy-recurrent

Brachytherapy- 5-7Gy-HDR

10-54Gy-LDR

EBRT+ Brachytherapy were well tolerated.

Nancy Lee et al Brachytherapy 2002

THE ROLE OF BRACHYTHERAPY IN EARLY-STAGE NASOPHARYNGEAL CARCINOMA

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150 patients

100 pts.- 64.8-68.4Gy EBRT, 5-16Gy/1-3# HDR

50 patients- 68.4-72.8Gy EBRT, no brachytherapy

3 prognostic groups- group I- <72.5Gy, No brachy

group II- 72.5-75Gy, 1-2# brachy

group III- >75Gy, 3# brachy

	n	Disease free 5-year rate (%)	Local control 5-year rate (%)	Disease specific 5-year rate (%)
Treatment group*				
I	50	71.6	73.7	77.0
II	71	92.4	93.9	95.5
III	58	77.0	79.5	82.4
p-value		0.0039	0.0064	0.0194
Pairwise comparison				
I vs. II		0.0006†	0.0007†	0.0106†
I vs. III		0.4489†	0.4120†	0.7459†
II vs. III		0.0078†	0.0154†	0.1020†

<u>Complications</u>

Group I- 1.9%

Group II-4.2%

Group III- 13.8%

P=0.03

Chang et al IJROBP 2002

Tata Memorial Hospital Experience

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Bull Cancer 2005 ; 92 (7-8) : E45-50

High dose rate brachytherapy boost for primary nasopharyngeal carcinoma: preliminary results of an ongoing prospective study

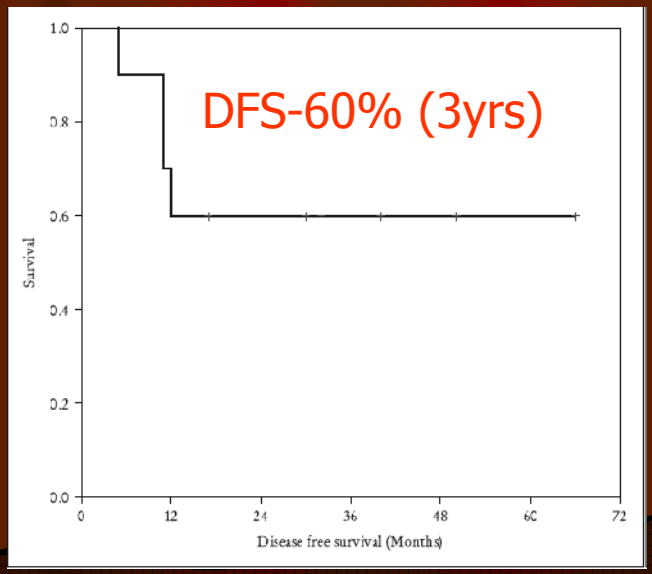
1998-2003, 10 patients of primary NPC

Median EBRT dose-66Gy

Median HDR-Brachy Boost dose-12Gy/1-4#

Rotterdam Silicone Nasopharyngeal applicator

Results Local control- 90%(3yrs)



Patient characteristics		Patients (nb)
Age (years)	≤ 50 years	6
	> 50 years	4
Sex	Male	7
	Female	3
Tumor Status	T1-2	6
	T3-4	4
Nodal Status	Node positive	8
	Node negative	2

Toxicity

No patient had significant late toxicities except

Mild Xerostomia-8/10

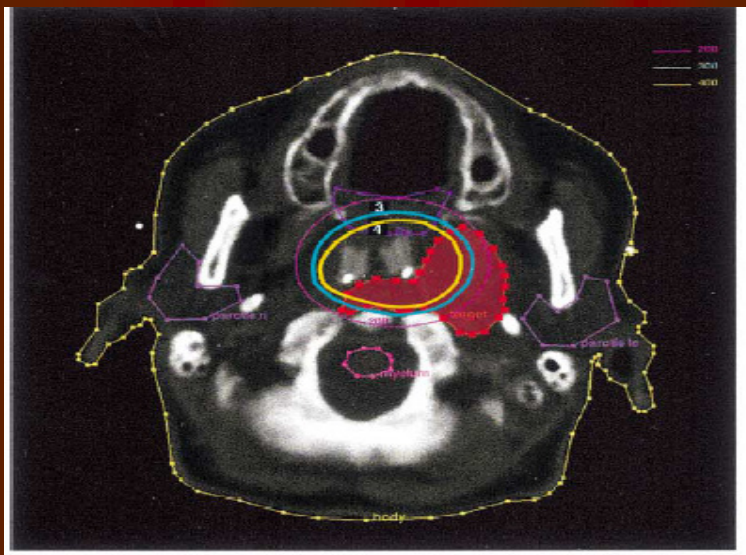
Persistent crust formation- 1/10

R Malde et al Bull Cancer 2005

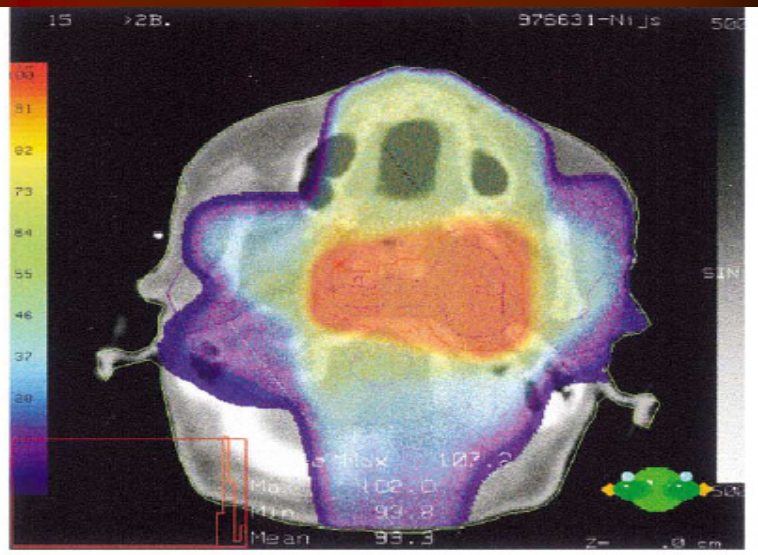
Literature Review of studies using ILBT as BOOST

Author [Ref]	T- Stage	Dose (Gy)		Chemo-therapy	5-yr local control	5-yr survival
		EBRT	Brachytherapy			
Chang [20] 1996	T1-2 (133)	64.8-68.4 Gy	HDR: 5-16.5 Gy/ 1-3 # @ 2 cm off axis	Nil	< 72.5 Gy : 73% 72.5-75Gy: 94% > 75 Gy : 79%	72% 92% 77%
Slevin [22] 1997	T1 = 1, T2 = 4 T3 = 3	45-60 Gy	HDR: 5-7.5Gy/ 1#	Nil	87% (3y)	37% (3y DFS) 75% (3y OS)
Levendag [7] 1998	T1 = 3, T2 = 9 T3 = 17, T4 = 13	T1-3 = 60 Gy T4 = 70 Gy	T1-3: 18Gy/6 # T4: 16Gy/4 # @ 1 cm off-axis	1 (2.5%)	86% (3y)	71% (3y DFS)
Syed [12] 2000	T1 = 1, T2 = 4 T3 = 6, T4 = 4	50-60 Gy	HDR Implant: 33-37 Gy	5 (33%)	59%	74% (5y DFS) 61% (5y OS)
Teo [18] 2000	T1 = 74 T2 = 89	60 Gy	HDR:18-24 Gy / 3# @ 1cm off-axis	10 (6%)	93%	88% (5y DFS)
De Nittis [23] 2002	T1-T3 = 11	64-70 Gy (66 Gy median)	HDR: 6-15 Gy / 1-2 # @ 0.5 cm	11 (100%)	100% (3y)	100% (3y OS)
Lee [19] 2002	T1 = 21, T2 = 18 T3 = 4	54-72 Gy	HDR 5-7Gy/1-2 # LDR: 10-54 Gy.	17 (40%)	89%	75% (5y DFS) 86% (5y OS)
Levendag [17] 2002	T1 = 7, T2 = 39 T3 = 11, T4 = 14	60-70 Gy	HDR: 11-18 Gy / 4-6 # @ 1 cm off axis	20 (41%)	I-IIB: 100% (2y) III-IVB: 86% (2y)	I-IIB: 90% (2y DFS) 61% (2y OS) III-IVB:74% (2y DFS) 66% (2y OS)
Ozyar [21] 2002	T1 = 45, T2 = 32 T3 = 13, T4 = 16	58-71 Gy (65.4 Gy median)	HDR: 12 Gy/3 # @ 1 cm off-axis	55 (51%)	86% (3y)	76% (3y CSS) 67% (3y DFS)
Lu [26] 2004	T1 = 22 T = 11	70 Gy	HDR: 10 Gy/2 # @ 1 cm off axis	33 (100%)	93.6% (2y)	74% (2y DFS) 82% (2 y OS)
TMH Present study	T1-2 = 6 T3-4 = 4	60-70 Gy	HDR: 5-14 Gy / 1-4 # @ 1 cm off axis	8 (80%)	90% (3y)	60% (3y DFS)

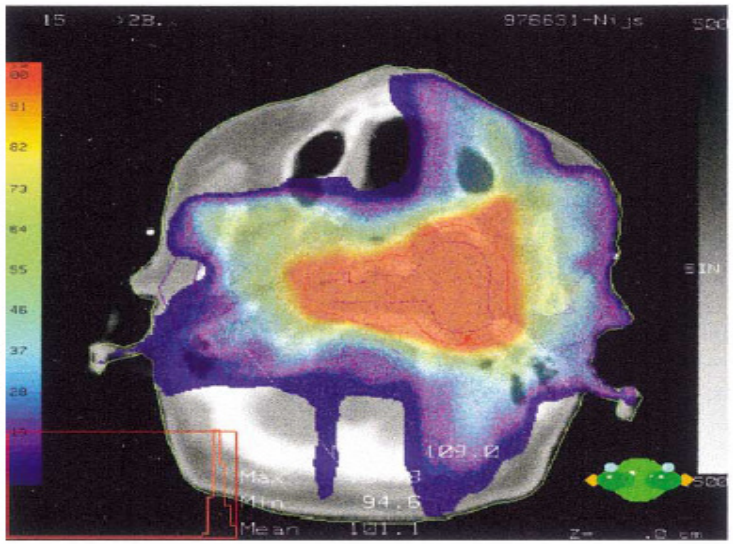
Malde et al Bull Cancer2005



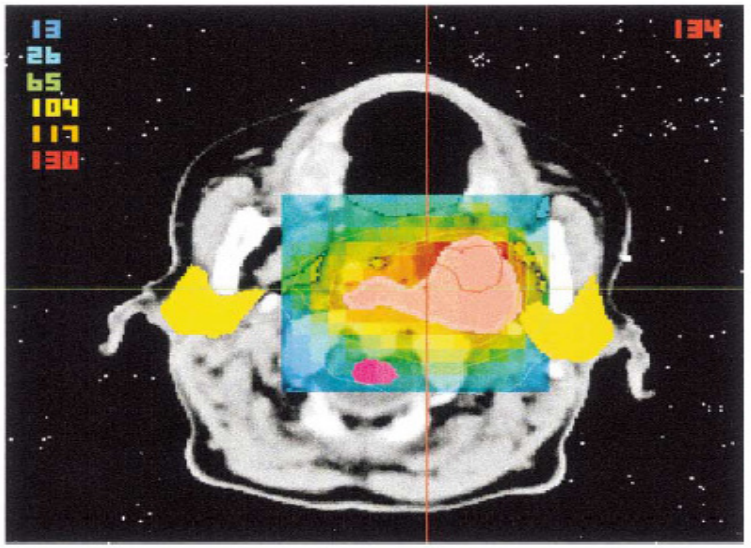
ECBT



3D-CRT



IMRT



SRT

Complications

1. Skin/soft tissue fibrosis
2. Hearing deficit
3. Xerostomia
4. Trismus
5. Taste alteration
6. Otitis media
7. Neuroendocrine dysfunction
8. Choanal stenosis/atresia
9. Olfactory dysfunction
10. Palatal and sphenoidal bone necrosis

Conclusions

1. ILRT has a definite role in patients with early stage nasopharyngeal cancer as boost after EBRT.
2. ILRT is also effective in cases of recurrent nasopharyngeal cancer specially for re-irradiation.
3. With the advent of 3DCRT and IMRT, the role of nasopharyngeal brachytherapy needs to be redefined.
4. In limited resource settings ILRT nasopharynx continues to be important.

THANK YOU