BrachyNext
Working Together to Shape the Future of Brachytherapy

The View From China: Brachytherapy in the World's Most Populous Country

Radioactive Seed Brachytherapy in China: Lessons From the First 14 Years

JunJie Wang, MD, PhD
doctorjunjiewang_edu@sina.cn
Peking University Third Hospital
Beijing,China

First case of prostate cancer with 125I seed in China

Professor Gordon Grado in Oct 17, 2001

14 Year later
125Iodine Seed Implant in China

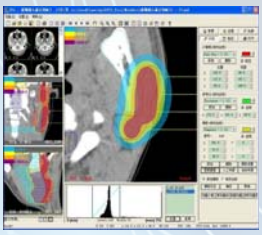
1000 hospitals
3000 doctors

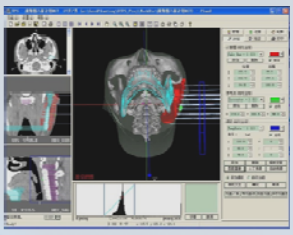
6 125I seed
3 TPS companys

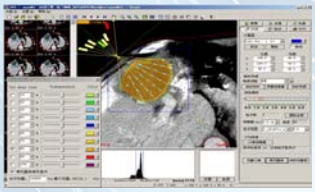
1000,000 seeds /year

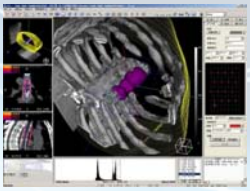
Chinese Association of Seed Brachytherapy in 2007

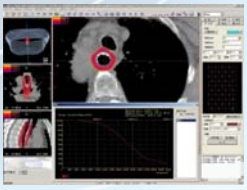
TPS for Body Seed Implant











Template-guided

Real -time plan

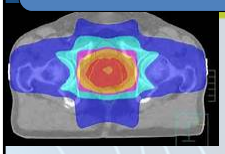
Why the seed implant develop so fast in China

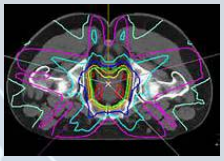
The Advantages of Permanent Seed Implant

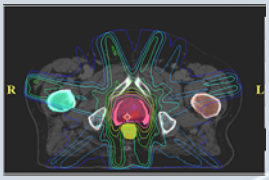
EBRT	3D-CRT	IMRT/IGRT	Seed
60-70Gy	70-80Gy	80-85Gy	140-160Gy

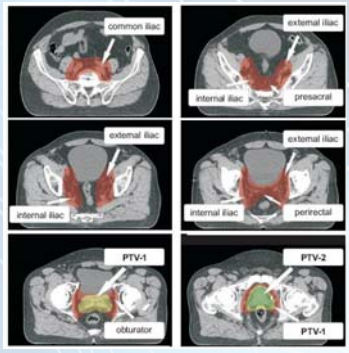
Dose escalation

External Beam Radiotherapy









- 3D-CRT
- IMRT
- IGRT

It was taken 100 years for EBRT dose not realize dose escalation

Why the Seed implant develop so fast in China

The biological advantages of seed implant

- ***Cell cycles distribution***
- ***Tumor cells repair***
- ***Tumor cells repopulation***
- ***Tumor cells reoxygen***

Subvert traditional 4R theory

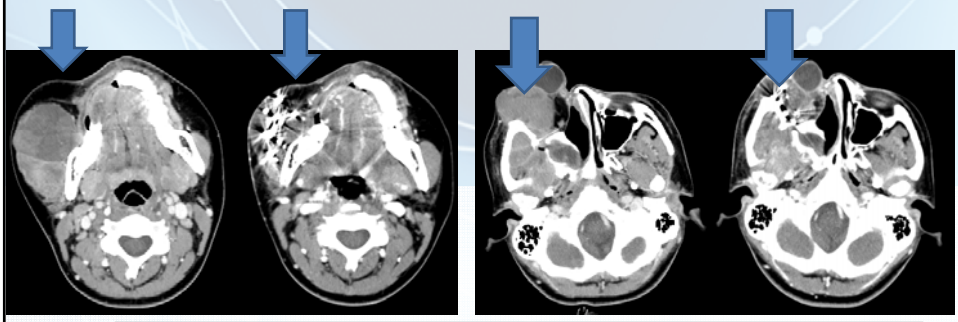
A revolution of radiotherapy

All the Ca is radiosensitive to Radiation

- *high doses*

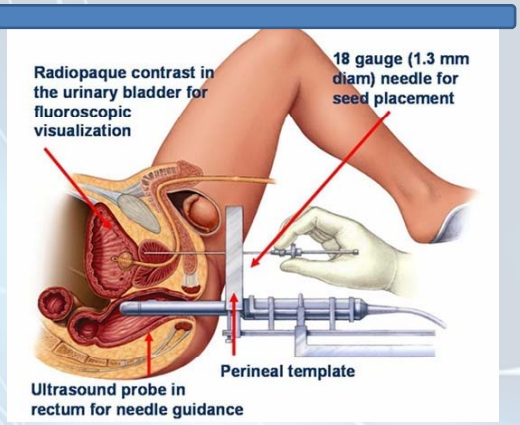
No sensitivity or resistant of ca to radiation

- ***EBRT*** *doses are too low*



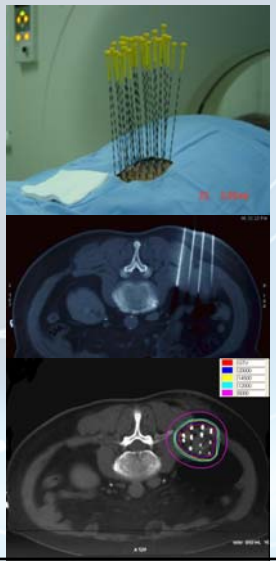
Recurrent Soft tissue carcinoma after Surgery and EBRT

Why Seed Implant play very well in prostate carcinoma



3D+Image-guidance =
High dose+Accuracy+Efficiency

CT-guided Seed Implant in 2002 in China



Surgery/interventional+ brachytherapy
= new discipline

CT-simulator Guidance for Seed Implant in 2012

CT-Guided Seed Implant Work-follow

Head Neck

放射性粒子治疗肿瘤

Peking University 3rd Hospital Experience

RADIATION ONCOLOGY IMPACT FACTOR 2.53

Research

Open Access

CT-guided iodine-125 seed permanent implantation for recurrent head and neck cancers

Yu L Jiang, **Na Meng**, **Jun J Wang**, **Ping Jiang**, **Hui SH Yuan**, **Chen Liu**, **Ang Qu** and **Rui J Yang**

Radiation Oncology 2010, **5**:68 doi:10.1186/1748-717X-5-68

Published: 30 July 2010

Abstract (provisional)

Background

To investigate the feasibility, and safety of 125I seed permanent implantation for recurrent head and neck carcinoma under CT-guidance.

Results

A retrospective study on 14 patients with recurrent head and neck cancers undergone 125I seed implantation. The post-plan showed that the actuarial D90 of 125I seeds ranged from 90 to 218 Gy (median, 157.5 Gy). The follow-up was 3 to 60 months (median, 13 months). The median local control was 18 months (95% CI, 6.1-29.9 months), and the 1-, 2-, 3-, and 5- year local controls were 52%, 39%, 39%, and 39%, respectively. The 1-, 2-, 3-, and 5- survival rates were 65%, 39%, 39% and 39%, respectively, with a median survival time of 20 months (95% CI, 8.7-31.3 months). Of all patients, 28.6% (4/14) died of local recurrence, 7.1% (1/14) died of metastases, one patient died of hepatocirrhosis, and 8 patients are still alive to the date of data analysis.

Radiation Oncology
Volume 5

Viewing options:
- **Abstract**
- PDF (253KB)

Associated material:
- Readers' comments
- PubMed record

Related literature:
- Articles citing this article
  - on PubMed Central
- Other articles by authors
  - on Google Scholar
  - on PubMed
- Related articles/pages
  - on Google
  - on Google Scholar
  - on PubMed

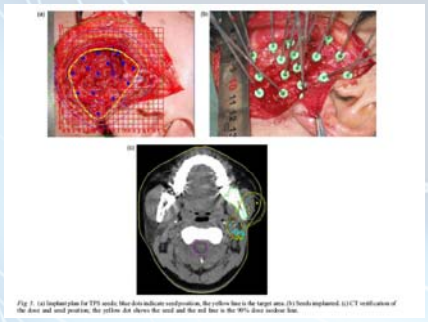
Tools:
- Download citation(s)
- Email to a friend
- Order reprints
- Post a comment

Post to:
- Citeulike
- Connotea
- Del.icio.us

Leading Clinical Paper
Head and Neck Oncology

^{125}I seed implant brachytherapy-assisted surgery with preservation of the facial nerve for treatment of malignant parotid gland tumors

J. Zhang, J. G. Zhang, T. L. Song, L. Zhen, Y. Zhang, K. H. Zhang, Z. H. Yang, G. Y. Yu
Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology, Beijing, China



International Journal of Oral & Maxillofacial Surgery

Journal of Radiation Research, 2012, 53, 973–977
doi: 10.1093/jrr/rrs046 Advance Access Publication 1 August 2012

A digital model individual template and CT-guided ^{125}I seed implants for malignant tumors of the head and neck

Ming-Wei HUANG[1], Shu-Ming LIU[1], Lei ZHENG[1], Yan SHI[1], Jie ZHANG[1], Yan-Sheng LI[2], Guang-Yan YU[1] and Jian-Guo ZHANG[1,*]

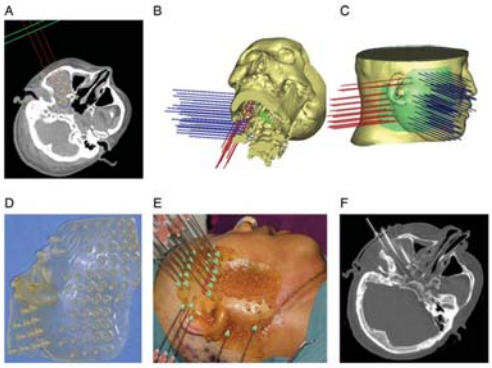


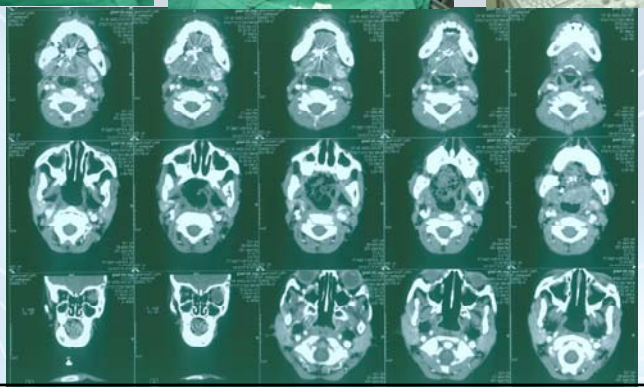
Fig. 1. (A) BTPS was used to construct the treatment plan (the red line represents the implant needle, and the yellow line represents the ^{125}I seeds); (B) the treatment plan in three-dimensional (3-D) images, showing how the mandibular ramus and major blood vessels (green arrow) were avoided; the needles are implanted in two directions; (C) the individual template was designed according to the 3-D appearance of the skin in the head and neck region and from information on the implantation needles; (D) an individual template of the parotid, infratemporal fossa and mandibular ramus region; (E) interstitial implantation guided by the individual template; (F) CT image showing the implant needles at the expected site under individual template guidance.

Noncoplanar is the future for seed implant

4/6/26

Alveolari Soft-part Sarcoma of Tongue after EBRT

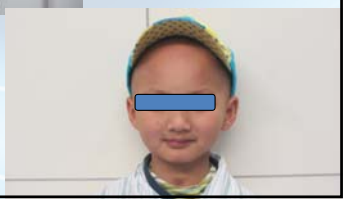


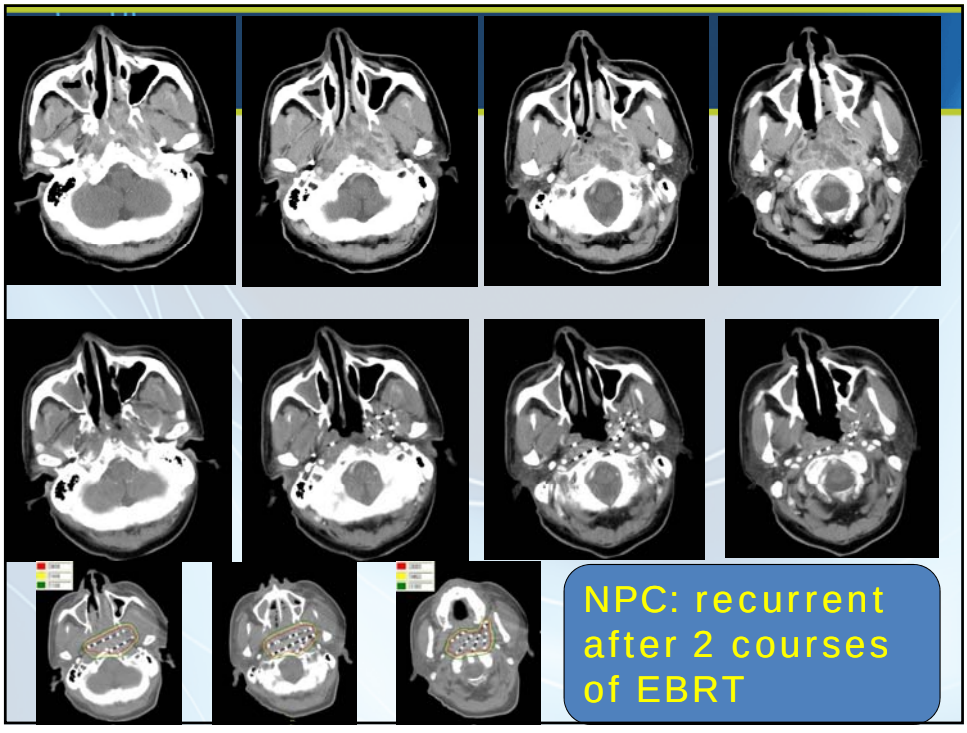



Recurrence after EBRT 57.5Gy + 6CTx

1 year later

4 y later





NPC: recurrent after 2 courses of EBRT

Maxillary Sinus Ca

粒子治疗肿瘤

The Recurrence of NPC After EBRT

Pre-implantation

Post-implantation

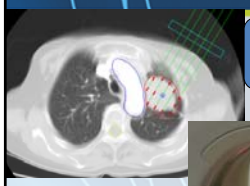
Lymph Node Metastases of Tongue Ca after EBRT

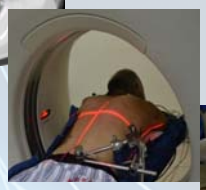


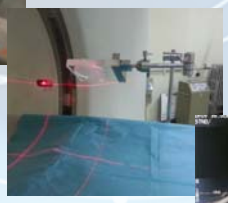
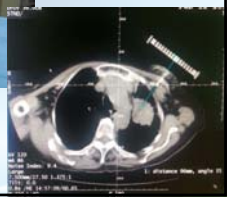

Pre-implant *Post-implant*

125Iodine Implant Template and Stabilization for Lung Ca

Tian Jing Medical School Second Hospital Experience

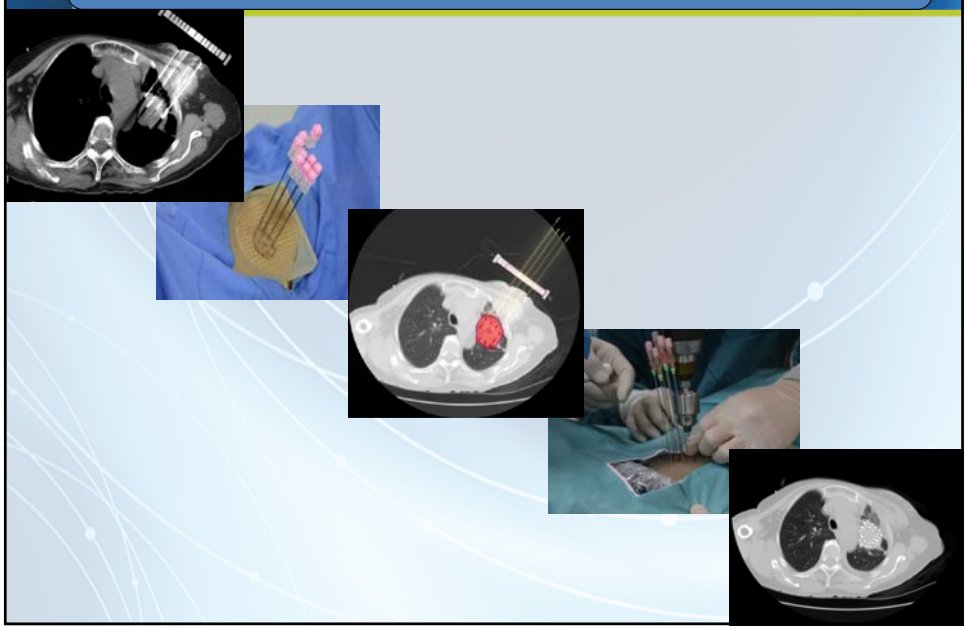




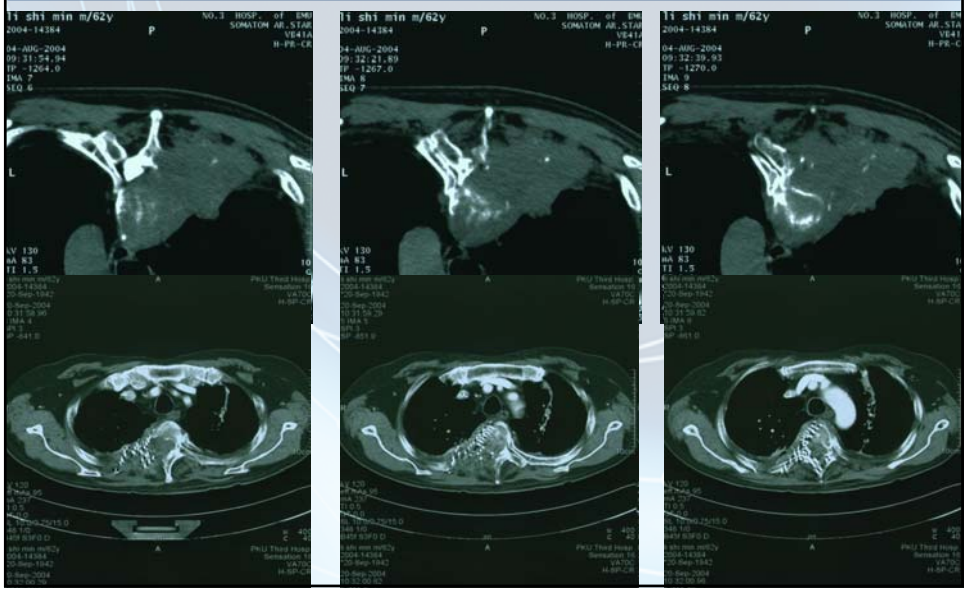



EBRT can not realize dose escalation for local advanced NSCLC

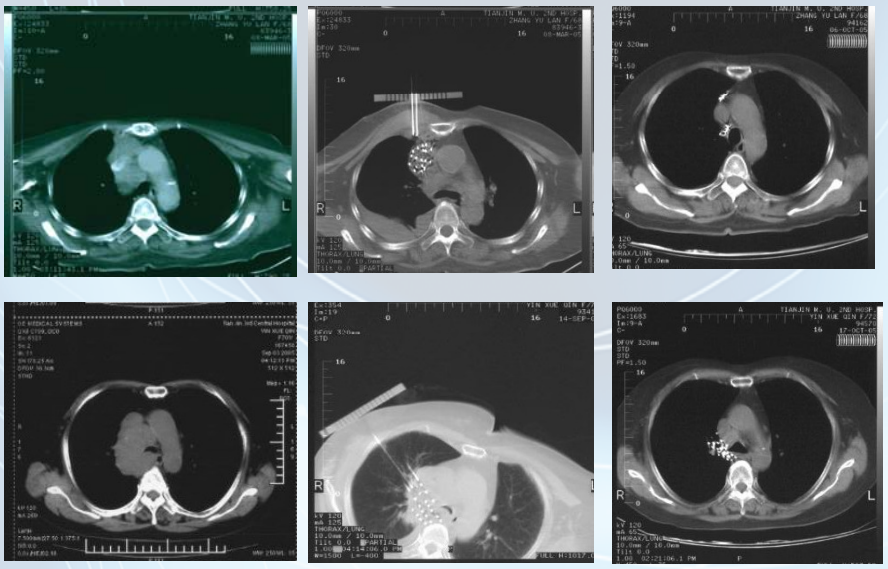
The work-follow of seed implant for NSCLC



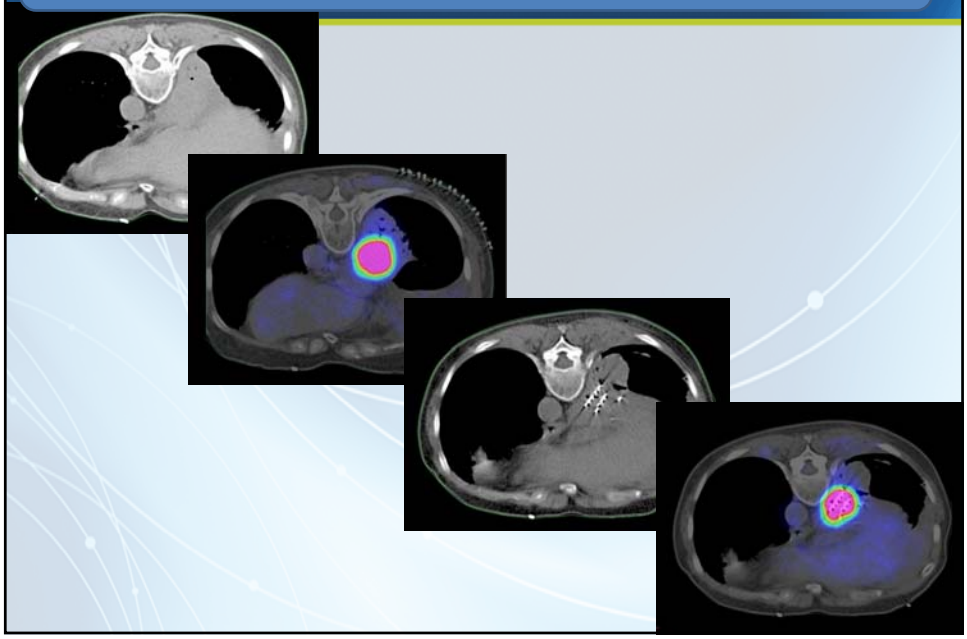
Recurrent NSCLC after EBRT+CTx



125Iodine Seed Implant for Stage Ⅲ NSCLC



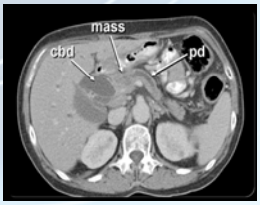
Pet-CT Guidance Seed Implant for Recurrent Lung Cancer after EBRT in 2013



Unresectable *Pancreatic Ca*

- **Surgery:100years**
- **59 clinical trail：**
- **22319 pts，5 y SR: 0.4%**

- **1005 pts：head: 5-ys: 4%**
- **The Gastrointestinal Tumor Study Group(GITSG):**
- **stage Ⅰ:2-Y: 17%**
- **5-y: 3%**



Cancer,1981(47):1456-1468

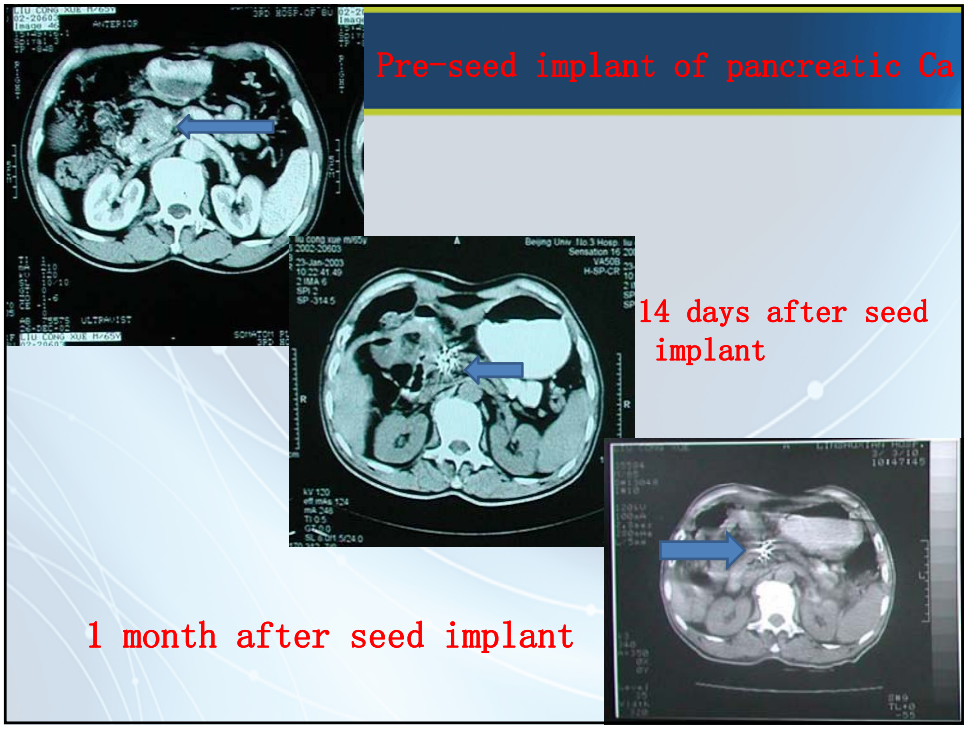
No any progression for surgery 100 years

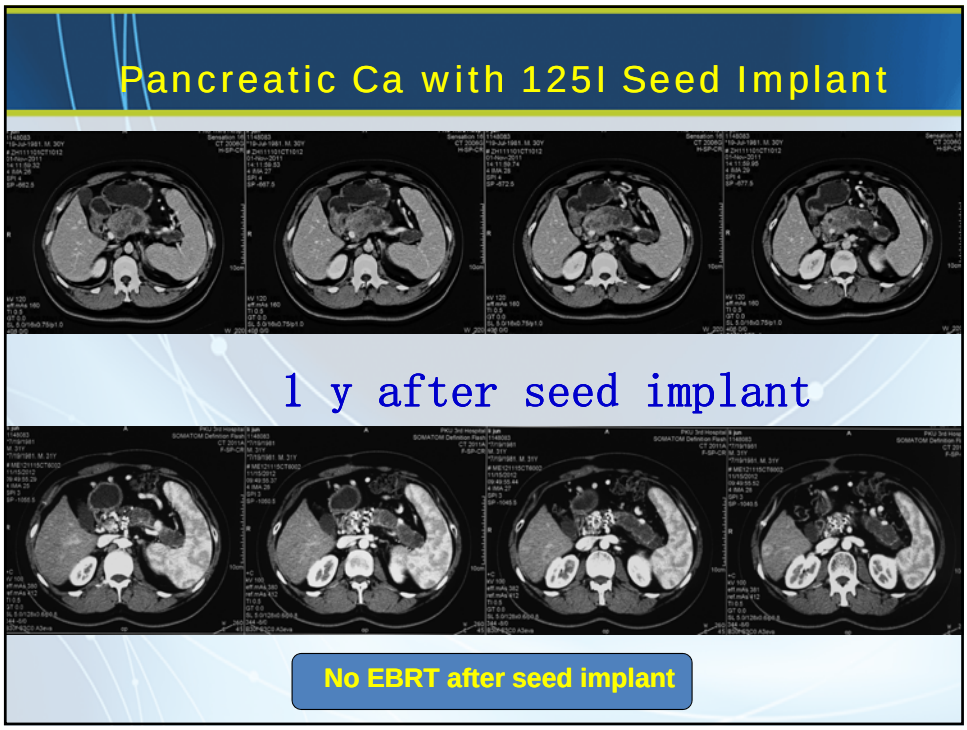
Ultrasound Guidance Seed Implant for Unreactable Pancreatic cancer






Intraoperation Ultrasound Guidance


Pre-seed implant of pancreatic Ca
14 days after seed implant
1 month after seed implant


Pancreatic Ca with 125I Seed Implant
1 y after seed implant
No EBRT after seed implant

Wang et al. Journal of Experimental & Clinical Cancer Research 2013, 32:106
http://www.jeccr.com/content/32/1/106

Journal of Experimental & Clinical Cancer Research

RESEARCH Open Access

The investigation of ^{125}I seed implantation as a salvage modality for unresectable pancreatic carcinoma

Hao Wang[1], Junjie Wang[1*], Yuliang Jiang[1], Jinna Li[1], Suqing Tian[1], Weiqiang Ran[2],

Abstract

Background: To assess the efficacy of intraoperative ultrasound-guided implantation of ^{125}I seeds for the treatment of unresectable pancreatic carcinoma, and analyze the associated prognostic factors.

Methods: Twenty-eight patients with pancreatic carcinoma who underwent laparotomy and were considered to have unresectable tumors were included in this study. Nine patients were pathologically diagnosed with Stage II disease, and nineteen patients with Stage III disease. Twenty-eight patients received intraoperative ultrasound-guided ^{125}I seed implantation and received a D_{90} (at least 90% of the tumor volume received the reference dose) ranging from 60 to 163 Gy, with a median of 120 Gy. Seven patients received an additional 35–50 Gy external beam radiotherapy after seed implantation, and ten patients received two to ten cycles of chemotherapy. Overall survival of the patients was calculated and prognostic factors were evaluated.

Results: Of the patients, 94.1% (16/17) achieved good to medium pain relief. The tumor response rate was 78.6% (22/28), and local control was achieved in 85.7% (24/28) of patients. The 1-, 2- and 3-year survival rates were 30%, 11% and 4%, and the median survival was 10.1 months (95% CI: 9.0-10.9). Analysis using the Cox proportional hazards model suggested that patients younger than 60 years and patients who received a D_{90} higher than 110 Gy may survive for a longer period.

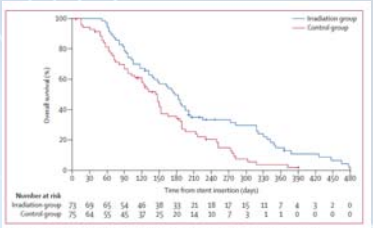
Conclusions: I seed implantation provides a safe and effective method to relieve pain, control local tumor growth and, to some extent, prolong the survival of patients with stage II and III pancreatic disease, without additional complications. Age and accumulated dose may be factors predictive of a favorable outcome for patients with unresectable pancreatic carcinoma treated with ^{125}I seeds. These findings need to be validated by conducting further studies with larger cohorts.

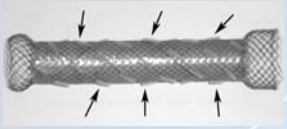
Keywords: ^{125}I seed, Intraoperative implantation, Ultrasound-guided, Unresectable, Pancreatic carcinoma

THE LANCET Oncology

Conventional stents versus stents loaded with ^{125}iodine seeds for the treatment of unresectable oesophageal cancer: a multicentre, randomised phase 3 trial

Hai-Dong Zhu, Jin-He Guo*, Ai-Wu Mao*, Wei-Fu Lv*, Jian-Song Ji*, Wen-Hui Wang, Bin Lv, Rui-Min Yang, Wei Wu, Cai-Fang Ni, Jie Min, Guang-Yu Zhu, Li Chen, Mei-Ling Zhu, Zhen-Yu Dai, Peng-Fei Liu, Jian-Ping Gu, Wei-Xin Ren, Rui-Hua Shi, Gao-Feng Xu, Shi-Cheng He, Gang Deng, Gao-Jun Teng*

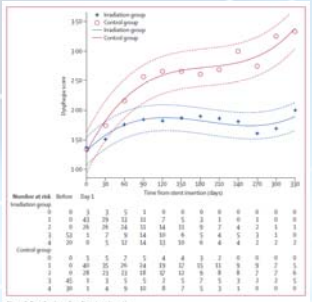




	Irradiation group (n=73)	Control group (n=75)	p value
Severe chest pain	17 (23%)	15 (20%)	0·754*
Fistula formation	6 (8%)	5 (7%)	0·790*
Pneumonia	11 (15%)	14 (19%)	0·464*
Haemorrhage	5 (7%)	5 (7%)	0·965*
Recurrent dysphagia	21 (28%)	20 (27%)	0·935*
Number of complications per patient			0·774†
0	32	33	
1	24	28	
2	15	11	
>2	2	3	

Data are number (%). *χ² test was used. †Kruskal-Wallis test was used.

Table 4: Complications and side-effects after stent placement



Research Article

EASL | JOURNAL OF HEPATOLOGY

A novel biliary stent loaded with ^{125}I seeds in patients with malignant biliary obstruction: Preliminary results versus a conventional biliary stent

Hai-Dong Zhu[1,†], Jin-He Guo[1,†], Guang-Yu Zhu[1], Shi-Cheng He[1], Wen Fang[1], Gang Deng[1], Yong-Lin Qin[1], Guo-Zhao Li[1], Douglas M. Coldwell[2], Gao-Jun Teng[1,*]

[1]Department of Radiology, Zhong-Da Hospital, Medical School, Southeast University, 87 Dingjiaqiao Road, Nanjing 210009, China; [2]De... of Radiology, University of Louisville Hospital, 530 South Jackson Street, Louisville, KY 40202, USA

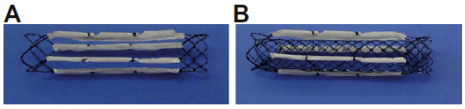


Fig. 1. Photographs of the irradiation biliary stent. (A) A separated part of the ^{125}I radioactive seeds-loaded-stent. (B) The assembled overlapped status by the ^{125}I radioactive seeds-loaded-stent and the conventional stent.

Table 4. Complications after stent placement.

Complications	Control group (n = 11)	Irradiation stent group (n = 12)	p value*
30-day death	3	0	0.093
Severe pain	2	1	0.590
Fistula formation	0	0	n.d.
Aspiration pneumonia	1	0	0.478
Hemobilia	2	0	0.217
Stent migration	0	0	n.d.
Restenosis	0	0	n.d.

Data are number.
*Fisher exact test was used.
n.d, Not done.

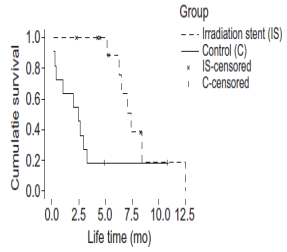
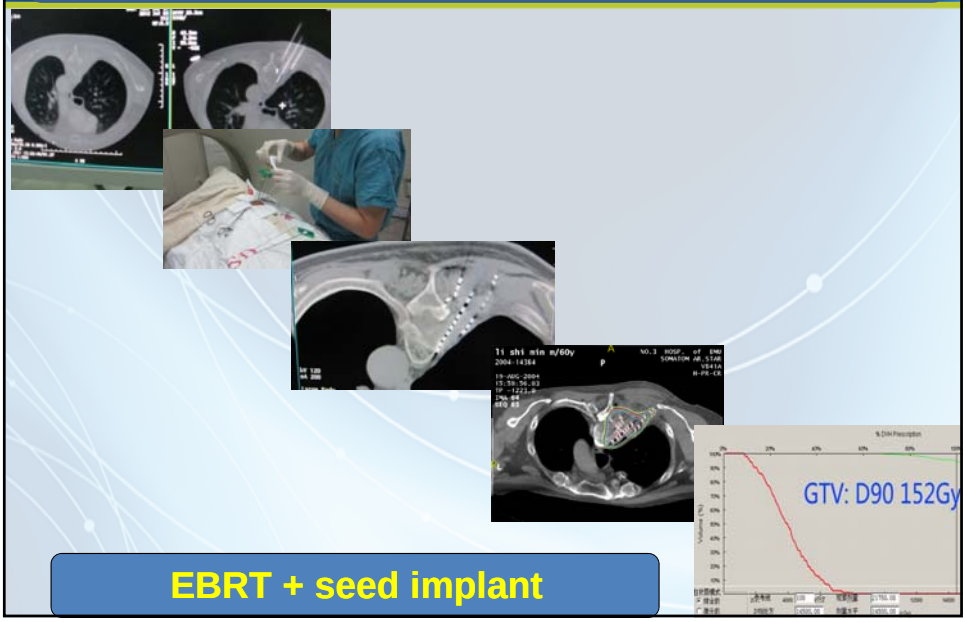


Fig. 3. Kaplan–Meier overall survival with irradiation stent group versus control group. Median overall survival was 7.40 months (95% CI: 6.204, 8.596) in the irradiation stent group versus 2.50 months (95% CI: 0.774, 4.226) in the control group, and mean overall survival was 8.03 months (95% CI: 6.142, 9.909) in the irradiation stent group versus 3.36 months (95% CI: 1.189, 5.520) in the control group ($p = 0.006$, log-rank test).

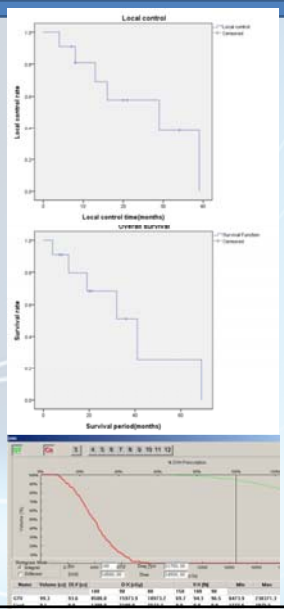
CT guided for recurrent spinal cord ca after EBRT



EBRT + seed implant

CT-guidance of ^{125}I seed implant as a salvage therapy for recurrent primary spinal tumors after Surgery and EBRT

- The median OS: 41 months
- 1, 2, and 5 y survival:
- 79.5%, 68.2% and 25.6%, respectively
- 1, 2 y LC: 69.3% and 38.5%, respectively,
- a median: 25.1 months
- 54.5% died of metastases, 9.1% local recurrence at 6 months
- 36.4% were still alive
- All pts pain relief and normal or improved ambulation without radiation myelitis

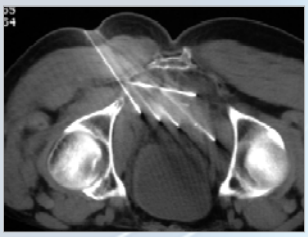


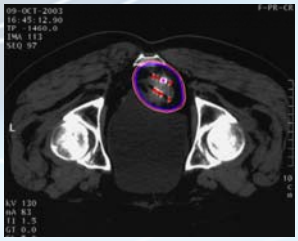
Peking University 3rd Hospital Experiences

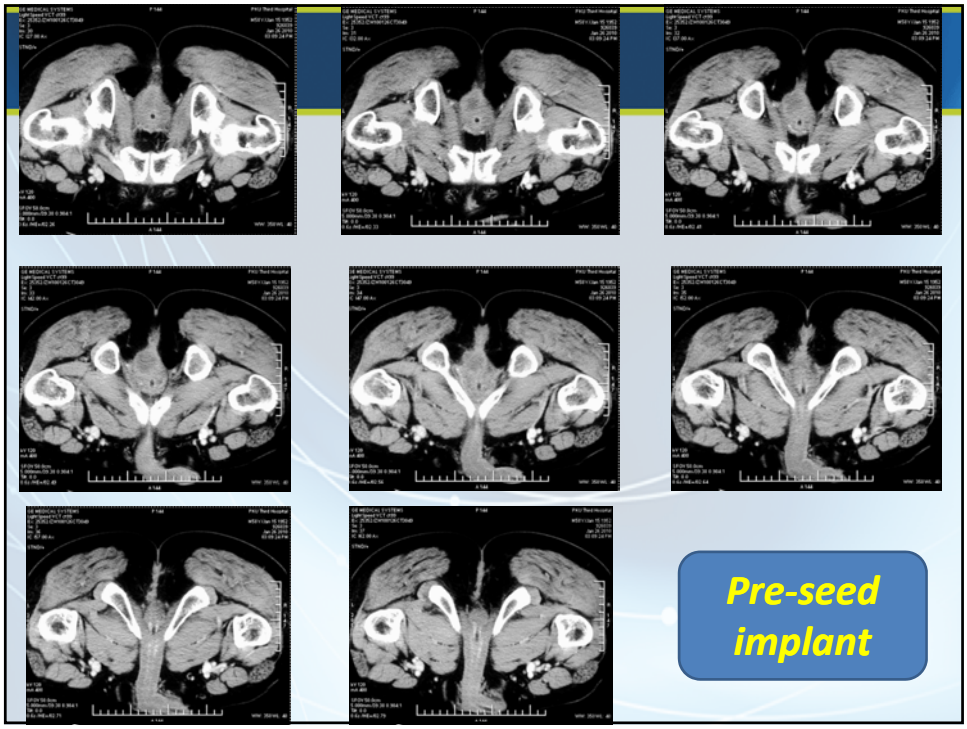
CT-Guided 125I Seed Implant for Recurrent Rectal Carcinoma

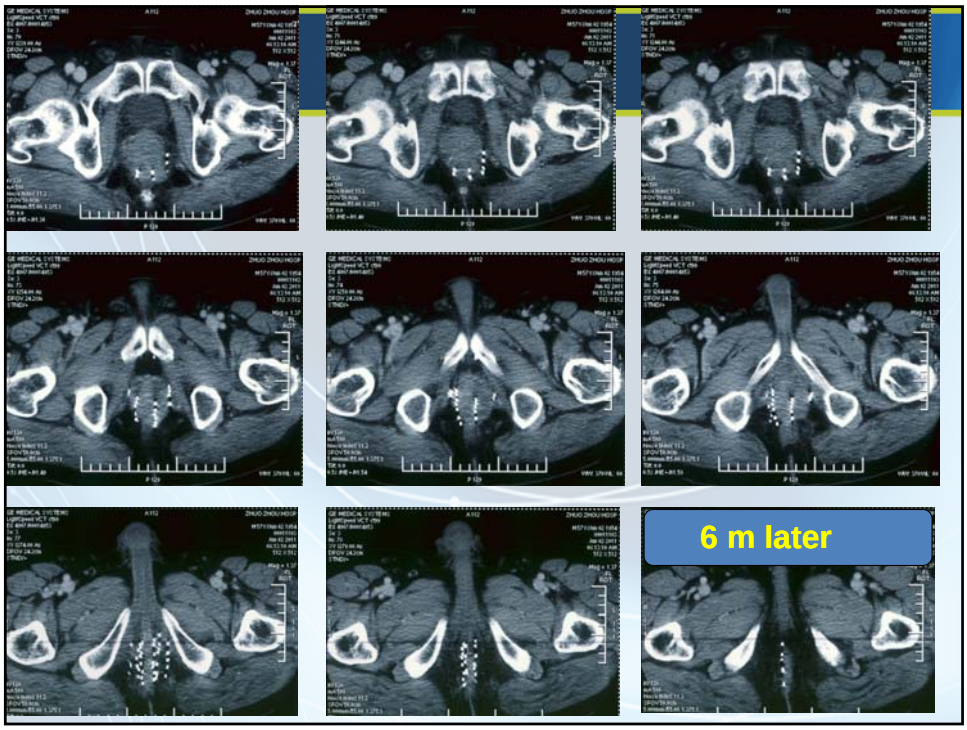
Peking University 3rd Hospital experience



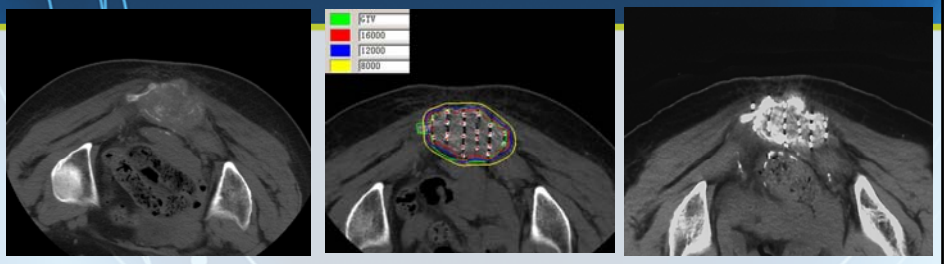


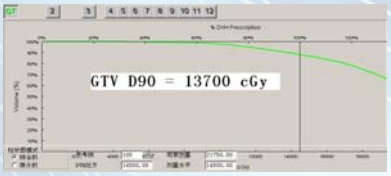

Pre-seed implant


6 m later

CT-guided 125Iodine Seed Implant for Recurrent Rectum Ca in Sacrum



Pre-seed implant | Post-seed implant | 6 month later



Median survival: 19.4 m

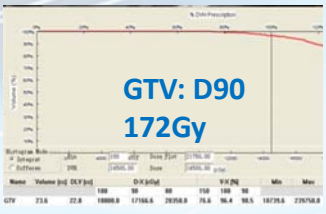
1y: 65.9%

2y: 20.1%

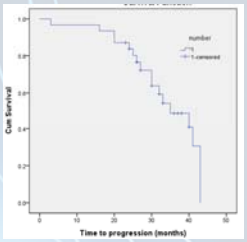
MDFS: 12m

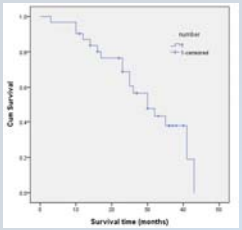
Pain relieve: 80%

CT-guided Seed Implant for Recurrent soft tissue Ca



Peking University 3rd Hospital Experiences for Soft Tissue Ca

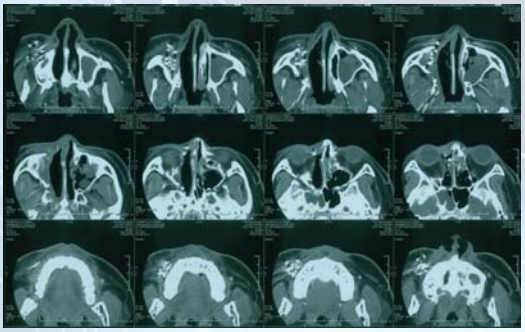




LC：1y: 92.6%，3y: 87.9%
Local control of 1- and 3- year :
92.6% and 87.9% （median 38 months）

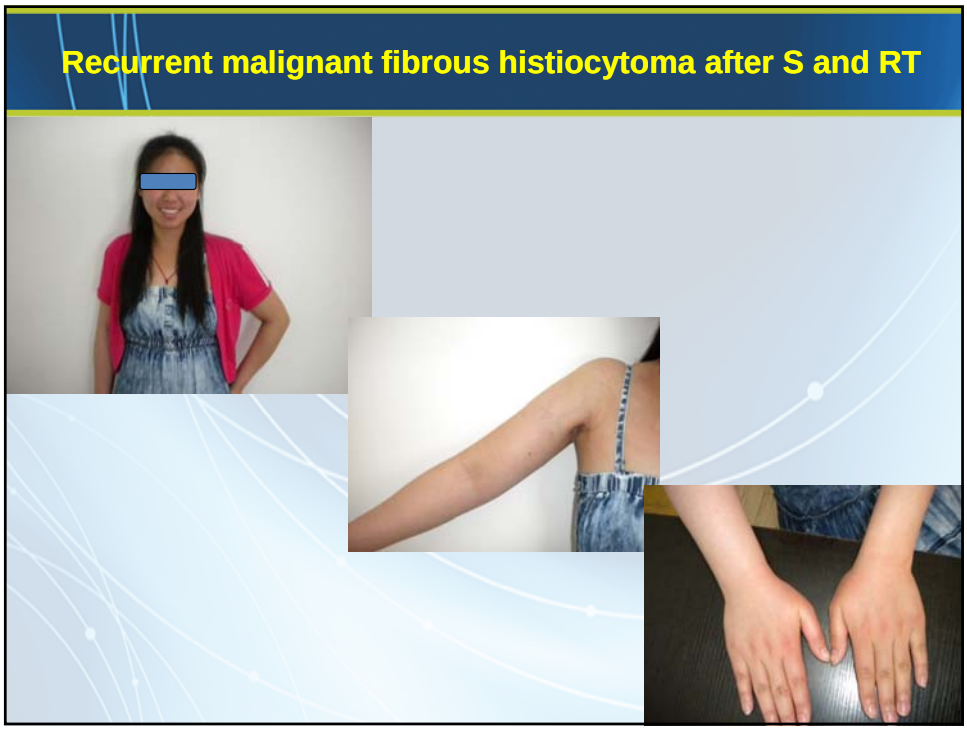
OS：1y: 86.3%，3y: 65.3%
Survival: 1- and 3- year
86.3% and 65.3% （median 34 months）

Adverse effects	Case	%
Subcutaneous hemorrhage	8	7.9
Grade III-IV skin toxicity	12	11.9
Fever	23	22.8



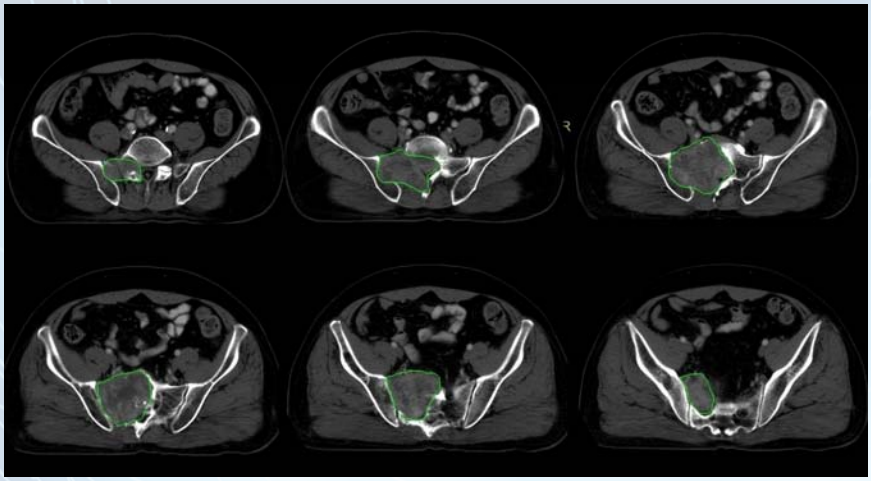
Maxillary Sinus Sarcoma After RT


Recurrent Soft tissue carcinoma after S and EBRT


Recurrent malignant fibrous histiocytoma after S and RT

Recurrent Soft tissue Sarcoma after EBRT in supraclavicular fossa

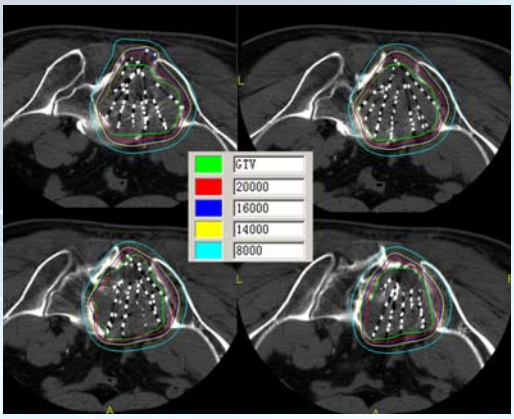
Sacrum Vascularsarcoma after S and EBRT



54Gy/18F/3.5w

Vascularsarcoma with 125Iodine Seed Implant

Dose Evaluation after 125Iodine Seed Implant



Books of Seed Brachytherapy in China

CT-guided + TPS Real-time Assistant Seed Implant

CT-simulator Guidance +TPS-Real time for Seed Implant

The Future of Seed Implant in Carcinoma

- New isotope
- Image-guidance
- Non-coplanar templete
  3D-pringting
- Real-time TPS-seed
- Navigator system
- Dose evaluation on time

Image-guided Seed Implant become the mainstream in the near future

Open New Era: Organ Preservation

Now: prostate and breast Ca

Next: lung, pancreas, liver?

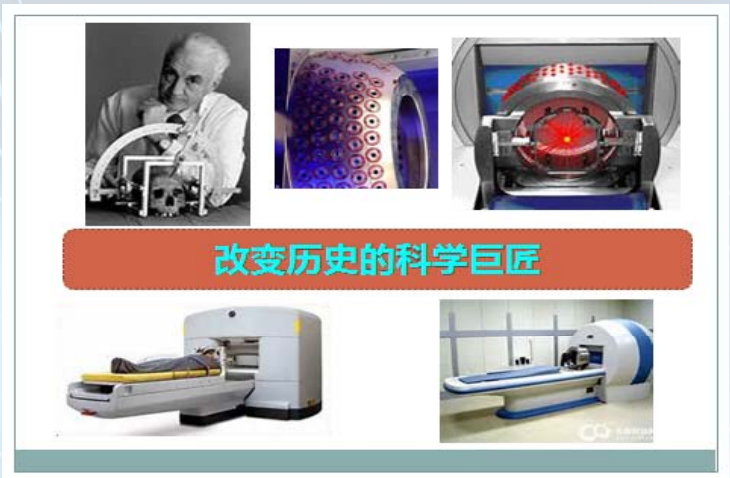
Future: EBRT + Seed Implant

Organ Preservation

Peripheral+central zone of target

2014/6/26

Professor Lars Leksell in 1967 at the Karolinska Institute in Sweden

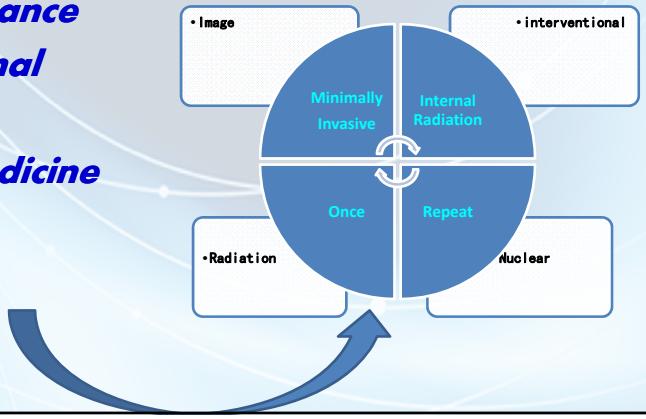


Surgery + Radiotherapy

New concept in year 2009: IGIRT

- *Image-Guidance Interventional Brachytherapy*

- *Image-guidance*
- *interventional*
- *Radiation*
- *Nuclear medicine*
- *Oncology*



Thank you for your attention

2014/6/26