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Brachytherapy

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Development and Current Situation of Brachytherapy in Mainland China

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Overview

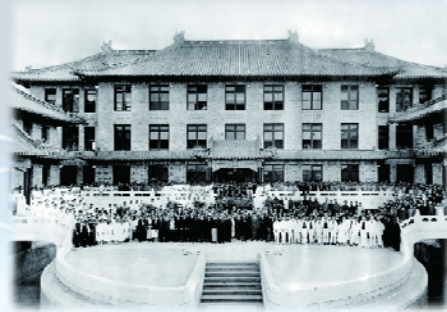
- History
- Current situation
- PUMC hospital experience



History

- In 1923, PUMC started to use Radium source to treat cervix cancer and other cancer

PUMCH is the most famous general hospital in China
Founded in 1921



History

In 1960's, Beijing system was developed for cervix cancer treatment in RITAN hospital in Beijing by Dr Wu Huanxing .

In 1980's, start to use remote afterloading system, mainly use Cs-137 and Co-60 sources

In 1989, first Nucletron microSelctron afterloader was installed in Beijing



Development of BT in China

Since 1990's, HDR brachytherapy started to be widely used.

Treatment expanded from gynecological cancer to whole body sites.

Local control rate was improved but a lot of complications were introduced

Development of BT in China

From 2000's, with the development of 3DCRT and IMRT, the clinical application of BT other than cervix cancer decreased significantly.

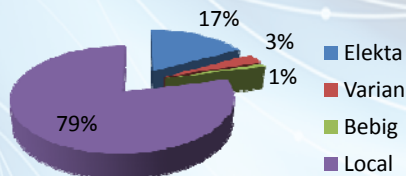
Some centers even wanted to use IMRT or SRBT to replace brachytherapy, but failure treatments are often



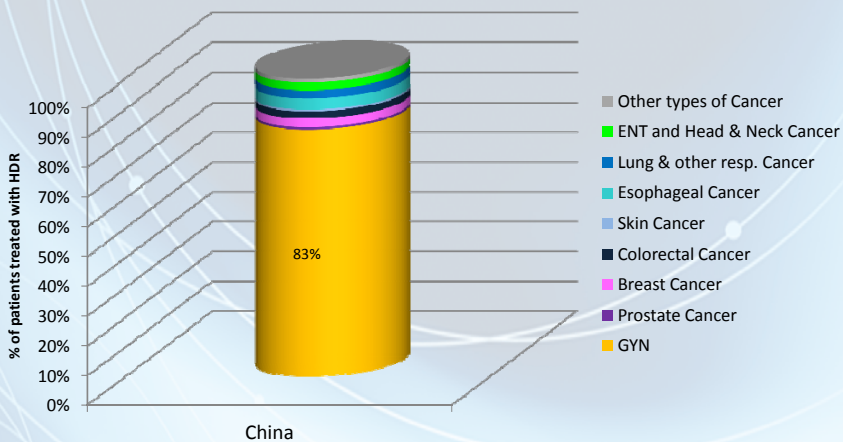
Current situation

With more than 10 years experience, more and more hospitals realize that brachytherapy is irreplaceable in cancer treatment especially for cervix cancer.

There are more than 300 afterloaders in Mainland China now.



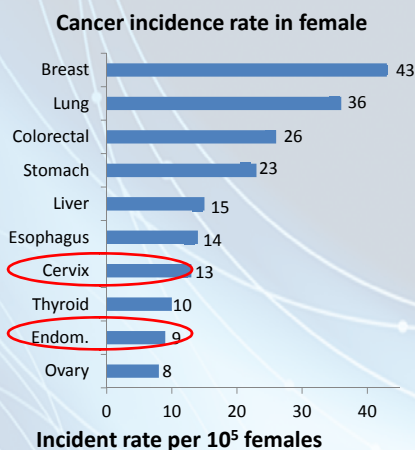
HDR application mainly on Cervix Cancer



Source: Market study report of Nucletron



Cancer incidence rate in China



- Cervical cancer is 2nd commonly cancer in female
- ~ 100,000 – 150,000 new patients per year
- ~ 30,000 died per year

China Cancer Registration Annual report 2012

Treatment protocol

Mainly by Ir-192 HDR afterloader

2D treatment based on ICRU 38 report

Some hospitals start to use CT/MR based 3D technique

Sichuan Cancer Hospital

HDR combined with IMRT

Xijing Hospital

CT based, treated more than 100 patients already

PUMC Hospital



Brachytherapy in PUMC hospital

Mainly on cervix cancer

Other tumor: endometrium ca, lung ca

Cervical ca: 700-800 patients per year

8-10 patients are treated in brachytherapy per day

Most patients are treated based on ICRU 38 report

60 patients have been treated with CT/MR based 3D technique

Our department

Treat 3000 patients nearly per year



microSelectron HDR



Varian Trilogy



Tomotherapy



Philips CT-sim



Ct-onrail



2300c/d



Clinical outcome

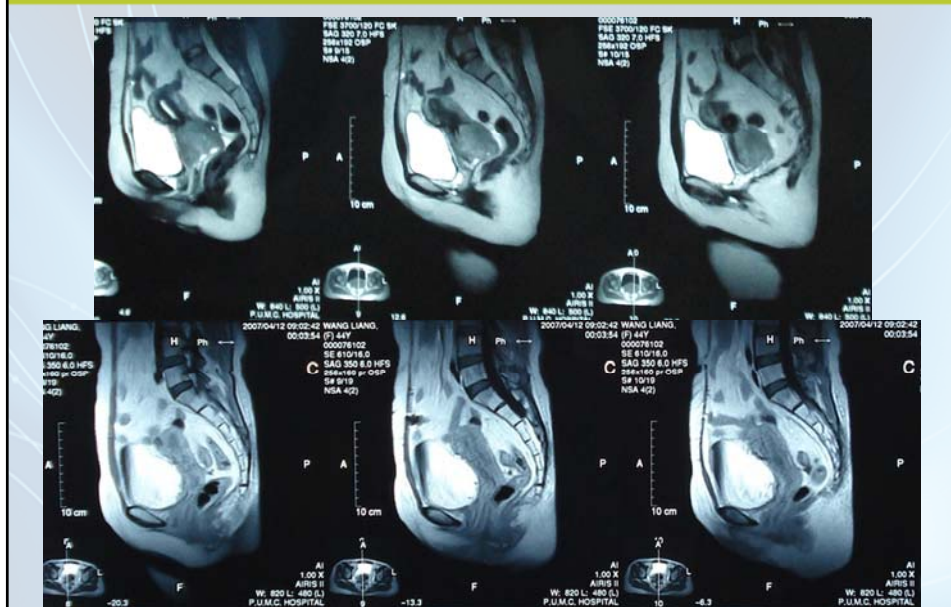
2006-2012, 108 patients with IIIB cervical cancer were treated in our department

Median follow up is 35.8 months

3 and 5 years overall survival rate is 65.8%
and 61.5% respectively

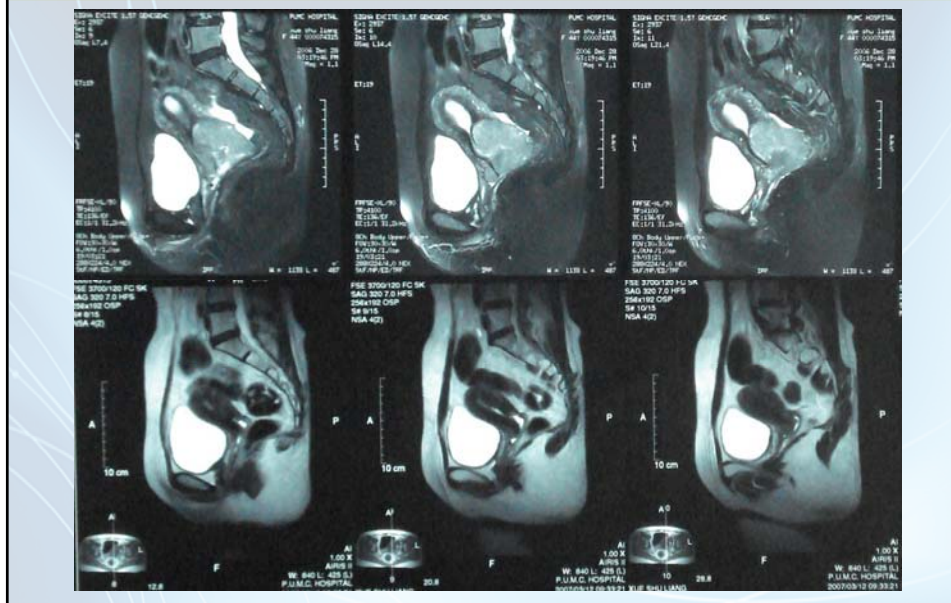
3 and 5 years disease-free survival rate is 58.3%
and 51.1% respectively

Clinical outcome





Clinical outcome



CT based 2D brachytherapy approach

Due to large patient load, 8-10 patients per day and limitation of MRI and 3D application

We are trying CT based 2D treatment

- Perform CT scan after applicator placement
- Treatment plan is based on Point A prescription
- Graphical/Manual optimization
- CT is mainly used to verify the position of applicators



The prospective study

All patients of cervical cancer treated by Fletcher applicator, CT based 2D brachytherapy

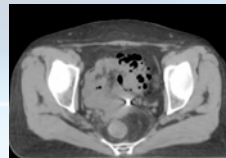
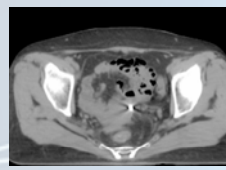
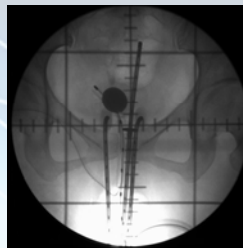
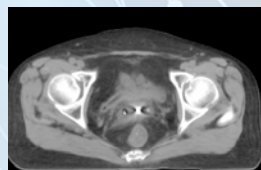
Total 93 patients, during 2013.4 - 2013.8 were involved in the study

CT scan was performed for all patients in the first fraction

- Measure the length and angle of uterus
- Record the cases of uterine perforation and poor position of applicators

Result of the study

- The incidence of uterine perforation is 3.2%
 - all of them were asymptomatic and the angle of uterine is maximum

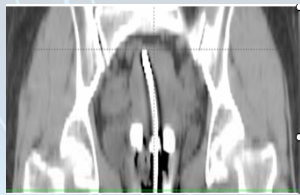




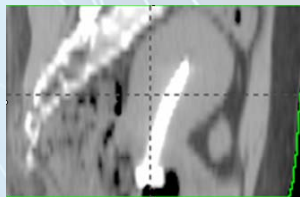
Result of the study

- The incidence of poor position of applicators is 28%
 - In 13 cases, the tandem was too close to the bottom of uterine
 - In 9 cases, the tandem deviated the central axis of uterine cavity
 - In 4 cases, the tandem was too far from the bottom of uterine
 - In 1 case, the applicators position was OK, but the uterus was small and surrounded by sigmoid colon

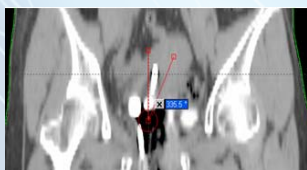
Some poor application position cases



Case A: The tandem is too close to the bottom of uterus which adjacent to small intestine



Case B: The tandem was too far from the bottom of uterus. The tandem is 7cm in the uterus but still 3.5cm to the bottom



Case C: The tandem deviated from the central of uterus to right side



Conclusion of the study

CT/MR image is necessary in brachytherapy

Asymptomatic uterine perforation and other poor position of applicators can be found by CT scan during brachytherapy

We can adjust the 2D plan and the angle of tandem in next fraction

CT scan in brachytherapy is easy and convenient , it can be widely applied in china

Summary

- Brachytherapy is in progress in Mainland China, but we are facing challenges
 - huge patient volume and huge divergence of technique

CT based 2D approach is more realistic to current situation , Tradeoff between efficiency and efficacy

CT/MR based 3D brachytherapy is our future

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THANK YOU FOR YOUR ATTENTION