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 Huanxiong.

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.

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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

#### Cancer incidence rate in female

- Breast: 43
- Lung: 36
- Colorectal: 26
- Stomach: 23
- Liver: 15
- Esophagus: 14
- Cervix: 13
- Thyroid: 10
- Endom.: 8
- Ovary: 8

**Incident rate per 10^5 females**

#### China Cancer Registration Annual report 2012

- Cervical cancer is 2\textsuperscript{nd} commonly cancer in female
- \(~100,000 – 150,000\) new patients per year
- \(~30,000\) died per year

### 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

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 cavity
  - 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 cavity
  - 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 is 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
THANK YOU FOR YOUR ATTENTION