Case report

THE ROLE OF INTERSTITIAL BRACHYTHERAPY IN GYNECOLOGICAL CANCERS

Ekkasit Tharavichitkul, M.D., Vicharn Lorvidhaya, M.D., Imjai Chitapanaraux, M.D., Pimkhuan Kamnerdsupaphon, M.D., Somsak Wanwilairat, Ph.D., Vimol Sukthomya, M.D.

Division of Therapeutic Radiology and Oncology, Department of Radiology, Faculty of Medicine, Chiang Mai University

Abstract

Objectives To report the results of interstitial brachytherapy (ISBT) in gynaecological cancers.

Materials and methods From January 2007 to December 2008, thirteen patients with gynaecological cancers were treated by interstitial brachytherapy. Eight patients were recurrent after irradiation and five had boost treatment after external irradiation. After treatment was completed, the patients were appointed to attend a follow-up program to evaluate results and toxicities.

Results At the median follow up of 5 months, Three patients (23%) yielded good local control. One patient developed vesico-vaginal fistula, due to tumour progression.

Conclusions Interstitial brachytherapy can be used as an option to irradiate patients and boost treatment. However re-irradiation with brachytherapy should be critically evaluated for toxicities and local control for the benefit and gain of the patients. Chiang Mai Medical Journal 2009;48(4):151-157.

Keywords: interstitial brachytherapy, gynecological cancers

Gynecologic cancer is one of the most common cancers in the female population of in Thailand.(1) Treatment of early disease is mainly surgery while in advanced disease, chemoradiation is the treatment of choice in advanced disease.(2-5) Radio-therapeutic management consists of external beam therapy (EBRT) and intracavitary brachytherapy (ICBT). Nowadays, with development of treatment, the results are preferable,
however, some of them still have recurrence. In recurrence at the primary site, the standard treatment of localized recurrent disease after RT is surgery, but unfortunately, not all patients can be operated. Moreover, due to previous irradiation, giving re-irradiation by external beam radiation (EBRT) is impossible, due to cumulative radiation in normal tissues. Brachytherapy (BT), the process that applies radioisotope source into or close to the lesion, can be used as an option. Brachytherapy for gynecologic cancers is divided to two types, according to methods of application. Intracavitary brachytherapy (ICBT) is a process that puts the radioisotope source close to the tumor in a cavity, and Interstitial brachytherapy (ISBT) is the method that puts the radioisotope into the tumor. However, in some situations, for example: bulky parametrial invasion, bulky primary disease, narrow vagina or poor geometry, ICBT is not enough, due to suboptimal dose distribution. ISBT can be used to get the better coverage of dose distribution. ISBT can be used to boost therapy from external beam radiotherapy and give a higher radiation dose to the target when normal external beam radiation or ICBT cannot treat it. Therefore, this study conducted an evaluation of ISBT treatment results in gynecological cancers at both recurrence and boost status.

**Materials and method**

Thirteen patients, who were treated with ISBT in the Division of Therapeutic Radiology and Oncology, Faculty of Medicine, Chiang Mai University from January 2007 to December 2008 were included in this study. Eight patients were treated as re-irradiation and the others as boost therapy. Spinal anesthesia was given to all patients lying in the lithotomy position. Foley’s catheter was inserted into the urethra for evaluating the bladder dose. Template guided implantation, with the Martinez Universal Perineal Interstitial Template (MUPIT), was applied in three patients, as in Figure 1 and 2, and free-hand implantation was applied in the other

![Figure 1. Patient with interstitial implantation (template guided technique)](image-url)
The role of interstitial brachytherapy in gynecological cancers

After implantation, a rectal tube was inserted for evaluation of rectal dose. Computed tomography was performed to guide radiotherapy planning. Clinical Target Volume (CTV), bladder, rectum and sigmoid colon were identified by a clinician, and radiotherapeutic planning was performed with treatment planning software. The dose of 6-30 Gy was calculated to treat the CTV. The dose of bladder and rectum was measured by planning software. The patients were appointed for a follow-up program to evaluate results and toxicities after completion of treatment.

Results

Thirteen patients were treated by ISBT. Their average age was 61 years (50-74 years). Nine patients were treated as re-irradiation and the others as boost therapy. Metastatic status was evaluated by clinical imaging or tissue diagnosis and all of the patients were proven to be without distant metastasis. The results of treatment are shown in Table 1.

After the median time of 4 months follow-up (range, 1 to 16 months), disease control could be received in three patients (23%), while four patients had persistent disease. Two patients were lost to follow-up and four had progression of disease after treatment.

In the re-irradiated group, their mean/average progression-free intervals after primary radiotherapy was 73 months (range 12-184 months). All of the patients were treated with radical radiotherapy, which was composed of EBRT plus ICBT (EBRT 56 Gray, ICBT 7 Gray * 4 fractions).

In the treatment period, four patients with progression had disease-free intervals at 7 months (range; 0.6 to 15 months). One patient, who developed lung metastasis in less than one month was given palliative treatment.

At complication status, one patient developed grade IV genitourinary system. Grade 3
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Dermatological toxicity was observed in one patient.

**Discussion**

Nowadays, treatment with interstitial brachytherapy (ISBT) is used with two intentions; firstly, to boost treatment for inadequate dose distribution of ICBT and, secondly, as a palliative procedure (re-irradiation) in cases of recurrence after primary treatment. In comparison to ICBT, ISBT is the better option for giving a high dose to the target, with its higher conformal dose distribution, and lower dose to normal tissue. Many studies are listed in Table 2. From a study at Ramathibodi Hospital, 10 patients were treated with Transperineal interstitial implant using the fluoroscopy-guided technique. Brachytherapy dose/fraction ranged from 500-750 cGy for 1 to 6 fractions. Combined external beam radiation was given in 8 patients. After 5-21 months follow-up, all the patients were still alive. Local control was achieved in 9 patients. One patient had persistent disease at the implant site. No acute complication from the procedure or serious late complication was observed.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Age</th>
<th>Diagnosis</th>
<th>Status of treatment</th>
<th>Total dose (Gy)</th>
<th>Side effects</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55</td>
<td>Recurrent HISIL</td>
<td>Re-irradiation</td>
<td>30</td>
<td>Grade 0 all</td>
<td>Persistent disease</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>Ca vagina</td>
<td>Boost treatment</td>
<td>30</td>
<td>Grade II GI</td>
<td>Persistent disease</td>
</tr>
<tr>
<td>3</td>
<td>52</td>
<td>Recurrent cervix</td>
<td>Re-irradiation</td>
<td>30</td>
<td>Grade 0 all</td>
<td>Persistent disease</td>
</tr>
<tr>
<td>4</td>
<td>58</td>
<td>Recurrent cervix</td>
<td>Re-irradiation</td>
<td>6</td>
<td>Loss of follow-up</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>Recurrent cervix</td>
<td>Re-irradiation</td>
<td>5</td>
<td>Grade IV (VV fistula)</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>6</td>
<td>58</td>
<td>Vaginal recurrence of cervix</td>
<td>Re-irradiation</td>
<td>29</td>
<td>Grade 1 Bowel/Bladder</td>
<td>NED</td>
</tr>
<tr>
<td>7</td>
<td>74</td>
<td>Ca vulvar</td>
<td>Boost treatment</td>
<td>21</td>
<td>Grade 1 skin</td>
<td>NED</td>
</tr>
<tr>
<td>8</td>
<td>50</td>
<td>Ca vagina</td>
<td>Boost treatment</td>
<td>12</td>
<td>Grade 0 all</td>
<td>NED</td>
</tr>
<tr>
<td>9</td>
<td>74</td>
<td>Ca vulvar (second primary)</td>
<td>Re-irradiation</td>
<td>30</td>
<td>Grade 0 all</td>
<td>Persistent disease</td>
</tr>
<tr>
<td>10</td>
<td>56</td>
<td>Bartholin mass</td>
<td>Boost treatment</td>
<td>27</td>
<td>Grade 3 skin</td>
<td>Progression of disease (Lung)</td>
</tr>
<tr>
<td>11</td>
<td>59</td>
<td>Ca cervix recurrent</td>
<td>Re-irradiation</td>
<td>30</td>
<td>Grade 0 all</td>
<td>Progression of disease</td>
</tr>
<tr>
<td>12</td>
<td>74</td>
<td>Ca cervix recurrent</td>
<td>Re-irradiation</td>
<td>25</td>
<td>Grade 0 all</td>
<td>Progression of disease</td>
</tr>
<tr>
<td>13</td>
<td>66</td>
<td>Vulvar cancer</td>
<td>Boost treatment</td>
<td>30</td>
<td>Grade 2 skin</td>
<td>Progression of disease</td>
</tr>
</tbody>
</table>

G=grade of toxicities, B=bladder, R=rectum, V=vagina, VV-fistula=vesico-vaginal fistula, NED=no evidence of disease, PD=progression of disease, PE=persistent disease
treatment with a MUPIT template in locally advanced gynecological cancers. Ninety seven patients were evaluated. With a series of follow-up during 20-60 months, local control was achieved in 64.7%, and the complication rate was 17.6%.(21)

In this study, local control was achieved in three patients, eight developed persistent or progressive disease and two had severe complications. The rate of local control was low because most of the patients in this study had recurrent disease after radiation. In comparison with other series, most of them received radical treatment.(8-19) Doses to normal organs, received by ISBT, were very low, but the organs had been previously irradiated with a high dose radiotherapy. Therefore, the accumulative dose to normal organs was very high, and very easily caused severe complications. The patient who developed VV-fistula had received irradiation twice before ISBT. The first irradiation was performed fourteen years previously and was administered 10 years later recurrence developed and a second EBRT with CT-based planning. In re-irradiation it is very hard to give the curative dose to post-irradiated areas, due to complicated precautions. Pre–evaluation of dose accumulation is very important to get the maximum benefit of re-treatment with ISBT. In the group that had progression of disease, patients yielded the median progression-free interval at 7 months (range; 0.6-15 months). Therefore, ISBT could be of benefit in some selected patients.

In a boost setting, the result was quite good. Three of four patients (75%) achieved local control without severe complications, but unfortunately, one patient developed lung metastasis without local recurrence.

Finally, the use of ISBT as re-irradiation should be carefully administered. Suitable evaluation of tumor progression and cumulative dose for normal tissue are very important in identifying patients who are good candidates for this procedure. Never the less, ISBT can be an option to treat local recurrence of gynecologic cancers, which are inoperable,
and it can be used as boost therapy in the treatment of gynecological cancers that are unsuitable for ICBT. Further investigation to identify suitable patients and beneficial procedures should be performed.

**Conclusions**

ISBT can be used to give high doses to a target and low doses to adjacent normal tissue in gynecological carcinoma in both recurrent and boost settings. In a recurrence setting, ISBT can be used as palliative treatment, which gives promising results. However, patient selection is the important factor, which correlates to results and complications.

**References**


The role of interstitial brachytherapy in gynecological cancers

บทบาทของ High-Dose-Rate Interstitial brachytherapy
ในผู้ป่วยมะเร็งนรีเวช

บทคัดย่อ

วัตถุประสงค์ เพื่อรายงานถึงการใช้รังสีรักษาระยะใกล้ แบบฝังในก่อนเมื่อง (interstitial brachytherapy) ในผู้ป่วยมะเร็งนรีเวช

ระเบียบและวิธีการ ในการวันที่ พ.ศ. 2550-2551 ผู้ป่วยมะเร็งนรีเวช จำนวน 13 ราย ได้รับการรักษาโดยการใช้ interstitial brachytherapy โดยผู้ป่วยทั้งหมด 8 ราย เป็นระยะกลับเป็นมาใหม่หลังการฉายรังสี และ 5 รายเป็นผู้ป่วยที่ได้รับการรักษาเสริม (boost therapy) จากการฉายรังสีจากภายนอก หลังการรักษาผู้ป่วยได้ส่งตรวจตามผลและผลข้างเคียงที่เกิดขึ้น

ผลการรักษา ในระยะติดตามผล 5 เดือน ผู้ป่วย 3 ราย (ร้อยละ 23) มีผลการควบคุมโรคที่ดี ผู้ป่วย 1 รายเกิดปัญหา vesico-vaginal fistula เนื่องจากมะเร็งลุกลามมากขึ้น

สรุป การใช้ interstitial brachytherapy สามารถใช้เป็นการรักษาต่อที่เลือกที่สุดในผู้ป่วยที่เคยได้รับการฉายรังสีรักษามาก่อนและการใช้รังสีเสริมจากภายนอก แต่อาจใช้ได้ตามการให้รังสีก่อนครั้งหนึ่งแล้วใช้รังสีระยะใกล้เมื่อ จึงเป็นต้องได้รับการประเมินโดยละเอียด ก่อนทำการรักษาเพื่อให้เกิดผลประโยชน์ต่อผู้ป่วยสูงสุด เชิงเทีะวิทยา 2552;48(4):151-157.

คำสำคัญ: รังสีรักษาระยะใกล้ มะเร็งนรีเวช