Vaginal vault brachytherapy: current issues in UK radiotherapy departments

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Introduction

Vaginal vault brachytherapy is a standard treatment for a number of different gynaecological cancers. It is typically used in conjunction with external beam radiotherapy (EBRT) for women with endometrial cancers after hysterectomy if there is considered to be a high risk of local recurrence. For those with intermediate risk disease, vaginal vault brachytherapy alone may be offered to reduce the risk of vaginal relapse after surgery. In some rarer circumstances it may be used in conjunction with EBRT for post-operative cervical cancers, where positive surgical margins or involved lymph nodes have been identified. Vaginal vault brachytherapy may also be used to treat primary vaginal cancers, as a boost after EBRT, or vaginal recurrence from cervical, endometrial, ovarian or vaginal cancers.

Bristol’s technique

At Bristol Haematology and Oncology Centre approximately 130-150 patients per year receive vaginal vault brachytherapy, with approximately 95% of cases as a post-operative adjuvant treatment for endometrial cancer. About 50% of these patients receive brachytherapy alone for intermediate risk endometrial cancer. We have seen brachytherapy referrals for patients in this category increasing after the publication of PORTEC-2, which showed vaginal vault brachytherapy alone to be as effective as pelvic EBRT for endometrial, ovarian or vaginal cancers.

EBRT, or vaginal recurrence from cervical, endometrial, ovarian or vaginal cancers.

Bladder filling and applicator angle

A number of studies have looked at whether bladder filling and applicator angle can reduce dose to organs at risk. The Mount Vernon team considered repositioning the applicator to the horizontal, to reduce rectal dose. An American centre has a similar technique, suggesting that angling the applicator anteriorly will reduce rectal dose. A UK study by Owadally et al has reported reduction in small bowel dose if a bladder fill protocol is adopted. There appears to be a
Wide variation is reported by brachytherapy radiographers across UK practice regarding applicator positioning and whether bladder filling is adopted or not. **Contouring and organs at risk** Some centres in the UK are using the 3D contouring tools typically used for intravaginal techniques for locally advanced cervix cancers, and applying these to vaginal brachytherapy. It has been reported at the Brachytherapy Radiographers Forum that high rectal doses seen at brachytherapy may lead oncologists to reduce prescribed brachytherapy dose, especially where the patient has already experienced significant bowel toxicity with pelvic EBRT. There seems to be some disagreement whether bowel and rectal tolerance could be exceeded with combined adjuvant EBRT and vaginal vault brachytherapy. **Alternative applicators** Where there is an unusual vaginal shape, potentially leading to sub-optimal vaginal mucosa and lymphatics doses, alternative applicators may be considered. The Bristol team have developed a technique using the flexible Manchester applicator (Varian Medical Systems) without the intravaginal applicator (figure 5). With CT imaging the positioning is checked to ensure ovoids are as close together as possible and spread of applicators is consistent, so a standard plan can still be delivered. This keeps planning time to a minimum as standard plans for the largest ovoids can be stored on the afterloader database, so individualised planning is not required. Some centres have purchased multichannel applicators, such as the inflatable Capri applicator (Varian Medical Systems) or the CT-MR multichannel applicator (Elekta) but these are typically being used for individualised planning for primary vaginal tumours or vaginal recurrence, rather than routine adjuvant vault brachytherapy (figure 6). For patients with an irregular vaginal vault shape a novel stereolithographic mould technique is being explored in Toronto. This aims to produce an individualised applicator with a multi-catheter from a CT image with contrast-soaked vaginal packing in situ. This is an interesting modern adaptation of the vaginal mould technique used by the Gustave Roussy team in Paris. **Length of vagina to treat and dose** There is currently little consistency about what vaginal length should be treated with vaginal vault brachytherapy for an adjuvant treatment. Some centres aim to treat the upper half of the vagina, some treat the upper third. Then there is the question of what the real vaginal length is. This may vary considerably between women and so the question arises whether the prescribed length should be individually adjusted. A CT image can clearly demonstrate where the vaginal mucosa finishes, if this adjustment is warranted. But it is important to note that longer length will ultimately increase toxicity and could be an overtreatment in the adjuvant setting. At the Brachytherapy Radiographers Forum meeting in June 2014 the range of doses being given across UK radiotherapy departments was reviewed and some disparity was found. Typical doses were 21 Gy in three treatments (as per PORTEC-2) and 21-22Gy in four treatments. However, there are some concerns among clinicians that the higher dose per fraction may lead to higher toxicity, especially vaginal toxicity where the surface dose is significantly higher than at the prescription point of 0.5cm. This may be especially important when a narrow vaginal cylinder is required. **Conclusion** Although vaginal vault brachytherapy with a vaginal cylinder technique is considered a simple and standard treatment for post-operative endometrial cancer, there are many variations in UK practice. Development of modern approaches such as CT-based imaging, organs at risk contouring and dose optimisation remain controversial and dependent on clinicians’ preferences until research evidence can provide some answers. **References** 1. Noak R A, Smit V T, Putter H et al. Vaginal brachytherapy versus pelvic external beam radiotherapy for patients with endometrial cancer of high-intermediate risk (PORTEC-2): An open-label, non-inferiority randomised trial. Lancet 2010;375:816-23. 2. Choo J J, Scudiere J, Bitterman P et al. Vaginal lymphatic channel location and its implication for intracavitary brachytherapy radiation treatment. Brachytherapy 2005;4:236-40. 3. Humphrey P, Cornes P, Al-Booz H. Vaginal vault brachytherapy in endometrial cancer: Verifying target coverage with image-guided applicator placement. British Journal of Radiology 2013;86:20120428. 4. Anjam P. Using ultrasound guidance for gynaecological insertions in brachytherapy. Imaging and Therapy practice. June 2013. 5. Hoskin P, Bounees P, Summers A. The influence of applicator angle on dosimetry in vaginal vault brachytherapy. British Journal of Radiology 2002;75:234-37. 6. Patel S, Mehta K J, Kuo H G et al. Interfraction dose variance in relation to vaginal cylinder insertion geometry and organ at risk filling for HDR brachytherapy. European Journal of Cancer 2013;49(S726). 7. Ouaddali W S, Penuich V, Barton N et al. Effect of bladder filling on dosimetry in high dose rate (HDR) vaginal vault brachytherapy for endometrial cancer. European Journal of Cancer 2013;49(S727). 8. Wiebe E M, Thomas G, Barbera L, Easton H, Razi A. Customised vaginal vault brachytherapy with CT imaging derived applicator prototyping. International Journal of Radiation Oncology Biology Physics 2012;84(3):81(S876).
Figures 3 and 4
CT images of air gaps around vaginal cylinders.

Figure 5
Flexible Manchester ovoids (Varian Medical Systems).

Figure 6
Capri multichannel inflatable applicator (Varian Medical Systems).