Types of Gynaecological Cancers

Cervical Cancer

Uterine Cancer

Ovarian Cancer

Endometrial Cancer

Cancer of the Vulva

Anatomy of the Uterus

The **uterus**, located in the pelvis between the rectum and the bladder, is divided into the **body (corpus)** and the **cervix**, separated by the isthmus.

The uterus is attached to the pelvis primarily by the **broad (lateral)** and **round (antero-lateral)** ligaments.

The utero sacral ligaments at the lower uterine segment and the cardinal ligaments at the upper lateral margin of the cervix contribute to supporting the uterus.

The main artery supplying the uterus is the **uterine artery**, a branch of the hypo-gastric artery.

The uterus has a **rich lymphatic network**; the lower and mid-third of which drain laterally along the para-metrium into the para-cervical lymph nodes and from here to the external iliac nodes (obturator nodes are the innermost component) and hypo-gastric nodes.

The pelvic lymphatics drain into the common iliac and peri-aortic lymph nodes. However, the lymphatics from the upper corpus and fundus pass laterally across the broad ligaments continuous with those of the ovary directly into the peri-aortic and upper abdominal lymph nodes.

Finally, there are lymphatic channels that drain along the round ligaments to the femoral nodes. **The anatomic distribution of the lymphatics represents the basis for radiation therapy delivery.**

Terminology

Epidemiology is literally translated from Greek, means "the study of people". Used to mean the study of diseases in populations. Epidemiology has three main aims:

1. To describe disease patterns in human populations.
2. To identify the causes of diseases (also known as aetiology).
3. To provide data essential for the management, evaluation and planning of services for the prevention, control and treatment of disease.

Aetiology: the causes of disease and factors underlying their spread.

Staging System: Staging is a way of describing where the cancer is located, if or where it has spread, and whether it is affecting other parts of the body.

Management options: Treatment choices.

Cancer of the Vulva

Vulval cancer is relatively rare

Treatment management approaches: a combination of surgery, chemotherapy, external beam radiation therapy (EBRT) and brachytherapy, which may be delivered with low dose rate (LDR) or high dose rate (HDR) brachytherapy.

Endometrial Cancer

Intra-cavitary vaginal brachytherapy (IVB) is an integral component in the adjuvant management of selected patients with early stage endometrial cancer (EC).

Potential advantages of IVB when compared with EBRT include lower costs, lower morbidity and patient convenience; the main disadvantage is that it does not address the pelvis and, therefore, should be limited to patients in whom the pelvic failure rate is estimated to be small and the vagina represents the organ at risk for recurrence.

Endometrial Cancer (cont)

There are no standardised treatment recommendations

Cervical Cancer

If there is less than 3 mm of invasion below the basement membrane, the risk of pelvic nodal spread is less than 1%.

treatment options include a simple hysterectomy or, if preservation of fertility is desired, cervical conisation and careful follow-up.

Cervical conisation: A procedure which excises a cone of tissue (mucous membrane) off the cervix for purpose of diagnostics and therapeutics (removes precancerous cells).

If the focus of invasion extends 3 mm or more or if there is lymph vascular space involvement, the risk of nodal spread increases to 2–8% and most oncologists recommend a (modified) radical hysterectomy with pelvic lymphadenectomy or definitive radiotherapy.

The advantage to a surgical approach is the possible preservation of ovarian function, the fact that the entire uterus is removed for analysis and the lack of long-term radiation side effects.

The advantages to definitive radiotherapy includes the lack of a need for prolonged general anesthesia, especially if high-dose-rate (HDR) brachytherapy is to be used.

For more **advanced disease** the management is generally definitive radiotherapy with both external beam and brachytherapy.

Low-dose-rate (LDR) brachytherapy has the longest experience record but as HDR brachytherapy has become widely available this approach is also favourable. There are advantages and disadvantages to each. Concurrent chemotherapy is also widely used in this group.

Carcinoma of the Vagina

The incidence rate is low.

Radiation therapy does provide excellent tumour control in early and superficial lesions, with satisfactory functional results.

This makes it imperative that radiation therapy techniques yielding optimal tumour control and functional results are utilised.

Otimal therapy for each stage is not well-defined in the literature.

Intra-cavitary and interstitial irradiation is used in small superficial stage-I disease. A combination of external beam radiation therapy, intra-cavitary brachytherapy (ICB) and/or interstitial brachytherapy (ITB) with or without chemotherapy is used in more extensive stage-I and stages II–IV disease.

Cervical Cancer Simulation and Planning

Design of the radiation treatment program depends on the extent and volume of the tumour.

Most patients receive a combination of external beam treatments and brachytherapy, although very early lesions may be treated with brachytherapy alone.

Advanced tumours require more external beam therapy. This is in part because the periphery of large tumours are inadequately treated with brachytherapy due to the rapid decrease in dose incurring at a distance from the implant.

To treat advanced tumours, the majority of the external beam therapy is given prior to initiating **brachytherapy** to shrink the tumour. This leads to a technically superior brachytherapy application and may result in **radiobiological advantages.**

Cancer of the uterine cervix spreads in a very predictable manner, first spreading laterally to the para cervical nodes, then to the internal common iliac and finally to the para-aortic nodes.

Cervical Cancer Simulation and Planning (cont)

The large range of organ motion in the pelvis creates challenges for Radiation Therapists and Oncologist, however the benefits of smaller PTV (planning target volumes) are extremely important as the PTV volume is directly related to the treatment toxicities/side effects.

External Beam:

The patient may be positioned **supine**, **prone** or **prone on belly-board.**

It could be argued that the patient will be more **stable in the supine position**, therefore the treatment delivery will be more accurate.

When the treatment fields are as large as they are for gynaecological malignancies, side effects induced become paramount. Therefore some centres will treat all of these patients **prone on bellyboard to reduce small bowel toxicity.**

Small bowel **contrast** will be administered prior to the patient getting on the simulator couch to help visualised the volume of the organ within the treatment fields. If large amounts of small bowel are included, the radiation oncologist may alter the field size or add shielding to minimise toxicity.

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Vaginal markers are necessary, patients may have had **gold seeds** implanted or the radiation oncologist will insert a contrast-coated tampon into the vagina. The vagina is not easily visualised on CT, so the tampon assists the radiation oncologist in orientating to the patient's individual anatomy when defining the radiation fields.

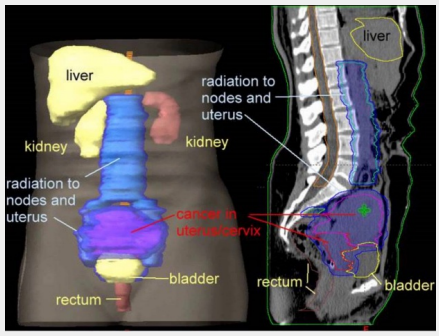
The CT scan acquired and transferred to the treatment planning computer.

The radiation oncologists will mark the target volumes on the CT, or MRI.

Cervical Cancer Simulation and Planning (cont)

For patients with cervical cancer the target volume is the cervix, uterus, uterosacral ligaments and nodes deemed at risk or known to harbour metastatic disease. The uterus is easily seen by means of CT scan or MRI. More difficult to visualise are ligaments which need to be included, especially in more advanced disease states. The bladder and rectum are outlined, as is the small bowel and kidneys.

Female pelvis imaging outlined



Cervical Cancer Dose/fractionation

Daily doses of 1.8 – 2.0 Gy are generally delivered. Depending on the treatment intent and combination of external beam radiation and brachytherapy, **total dose** will range from **45 – 55Gy.**

Many studies or clinical trials utilise **50.4 Gy in 28 fractions**. Treatment will be delivered **once daily, 5 fractions per week, over 5.5 weeks.**

External beam treatment may be delivered in a phased approach, whereby the treatment fields are reduced down for the later fractions to reduce toxicity.

Evaluation of the plan. Plan criteria:

-the isocentre is in the correct position
-the dose distribution is homogeneous meeting ICRU dose recommendations, and
-dose to **critical structures**: small bowel, rectum, femoral head, and bladder using dose volume histograms.

Organ at risk tolerance dose guidelines:

Cervical Cancer Dose/fractionation (cont)

Small bowel < 30% to receive ≥ 40 Gy
Rectum < 60% to receive ≥ 30 Gy
Bladder < 35% to receive ≥ 45 Gy
Femoral head ≤ 15% to receive ≥ 30 Gy

Treatment

Whole pelvis radiotherapy (RT) for gynaecological cancer has remained largely unchanged for decades, and the associated **gastrointestinal, genitourinary, and haematological toxicities** resulting from these **large fields** have been accepted as unavoidable. The addition of **concurrent chemo-radiotherapy** improves the **overall survival rates** for cervical cancer, at the cost of **increased acute toxicity. Late Grade 3 or 4 toxicity is estimated to affect ≤20% of patients.**

IMRT is the external beam treatment technique of choice for gynaecological cancers.

Dose fractionation schedules could include:

-50.4 Gy/1.8 fractions to pelvic lymph nodes + 20 Gy to cervix
-50.4 Gy/1.8 fractions + 6 Gy brachytherapy + cisplatin
-Pre-operative Conformal RT: 46.4 Gy⁎ (42.8–46.4)
-Post-operative: 50.4 Gy⁎ (50.4–64)

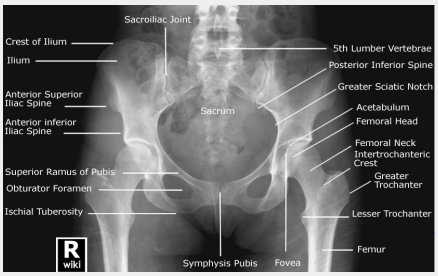
VERIFICATION and LOCALISATION

Internal organ motion (IOM) is an important factor in gynaecological patients. Movement of the cervix and uterus have significant impacts on margins.

The uterus has been found to move with respect to bladder filling and the largest effect is in the Sup/Inf direction. The median movement if the corpus uterus has been found to be 7mm in several studies with a range of 3-15mm recorded, the the cervix 4mm, with a range of 1-6mm.

Daily online verification may be required for treating tumours with very small margins or those likely to have large internal movements.

Anatomical structures in the pelvic region



Complications

Cancer of the Cervix and Endometrium side effects depend on multiple factors.

Treatment related factors include the size of the treatment volume, treatment fields delivered, critical structures, fraction size, total dose, whether the patient is having external beam and/ or brachytherapy and/ or concurrent cytotoxic chemotherapy, and the brachytherapy technique used.

Patient-related factors include : the stage and extent of the disease, weight, age, smoking history and number of previous abdominal surgical procedures

Side effects:

Acute sequelae including: diarrhea, bowel irritation (gas and/or cramping), cystitis, skin erythema, fatigue, and lowered peripheral blood counts, ovarian failure occurs in nearly all patients.

Gastro-intestinal (GI) side effects may also present early into the course of treatment.

Mild bladder irritation, the patient should be informed to increase their fluid intake

If **extended fields** are used to treat patients then this may cause **nausea and sometimes gastric irritation.**

If the patient is on **concurrent chemotherapy** for the disease all of the above reactions are likely to be of **increased severity.**

Brachytherapy risks include: uterus rupture, fever, and the usual risks of anaesthesia.

Complications (cont)

The **long term complications** include: rectal bleeding, stricture, ulceration, fistula, small bowel obstruction occurs very rarely, a constant low risk of urinary tract complications.

Radiation-induced injury to the small and/or large bowel is not simply dependent on radiation dose, fractions, amount of exposure and fields selected alone. There appears to be a complex interaction of patient, genetic and treatment factors that contribute to incidence, severity and chronicity of symptoms

Late injury due to **small vessel injury with endothelial damage, inflammation fibrosis, ischaemia and necrosis** typically becomes symptomatic after a latent period between the end of acute effects and the development of late effects, but there may be a continuous progression from oedema, mucosal and submucosal inflammation and persistent ulceration to fibrosis

Clinically severe late radiation damage can present as **strictures and stenoses with obstruction, fistulas and bowel perforation**

There is a risk of **vaginal shortening** particularly in older and post menopausal women. This can be very distressing and be a sensitive issue for patients and their partners to deal with.

Advice should be given to the patient on sexual activity during and after the course of treatment.

Some individuals or couples may require sexual **counselling** for issues related to the diagnosis and so should be referred to the appropriate member of the **multi-disciplinary team.**

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Follow up

The radiation oncologist will follow up the patient around six weeks post completion of the radiation therapy.

After six weeks any radiation-induced side effects should have subsided, and there should be some indication of tumour response.

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