Radiation therapy, also called radiotherapy, is a treatment that uses high-energy rays (i.e., x-rays) to destroy cancer cells. It is more commonly used in treating rectal cancer than colon cancer. Radiation therapy can be used alongside surgery and chemotherapy to treat rectal cancer. The benefits of using radiation therapy are:

- Control the cancer growth
- Relieve symptoms (i.e., pain)
- Help cancer from returning
- Retreat tumours that may have come back
- Help treat cancer that has spread to other areas

External Beam Radiation Therapy (EBRT) is the most common technique when treating colorectal cancer. A machine located outside of the body called a linear accelerator produces high-energy x-rays that are focused on the bowel and pelvis to kill cancer cells in that area. This will stop the cancer cells from dividing. Multiple visits from the patients are required to accurately deliver the radiation to the area of concern. Surrounding healthy tissues will be affected but if the cells are normal, they have a higher chance to heal from radiation injury than cancer cells.

Illustration of External Beam Radiation Therapy for Colorectal Cancer
Intraoperative Radiation Therapy (IORT) is radiation delivered right to the area of concern during surgery. This therapy avoids contact with the normal tissue and will kill any cancer cells that may be left behind. IORT is used when the cancer is difficult to remove during surgery or if microscopic amounts of cancer are still present.

Illustration of Intraoperative Radiation Therapy for Colorectal Cancer

During IORT, radiation is directed to the area of concern avoiding contact with normal cells. 

Courtesy of: Mayo Clinic

Image source: https://www.mayoclinic.org/tests-procedures/intraoperative-radiation-therapy/about/pac-20385150

For rectal cancer, radiation therapy can be used before or after surgery. Neoadjuvant is radiation therapy given to the patient before surgery and is done to shrink large tumours making it easier for the surgeon to remove the entire tumour. Adjuvant is radiation therapy given to the patient after surgery. This can be done either alone or in combination with chemotherapy to reduce the chances of the cancer returning. Using both radiation therapy and chemotherapy together is called chemoradiation. Depending on the reason for radiation, it can be given over the course of a few days or weeks.
Radiation therapy can be done on its own or in the absence of surgery. Some patients may not be healthy enough to undergo surgery or might have advanced rectal cancer causing intestinal blockage, bleeding, or pain. If this is the case, radiation therapy can be used on its own or alongside chemotherapy.

**TREATING STAGE IV (METASTATIC) COLORECTAL CANCER**

In stage IV colorectal cancer, the cancer has travelled to distant organs such as the liver or lungs.

**Treating liver metastases**

Radiotherapy is an alternative treatment if surgery is not a good option (e.g., poor health or reduced liver function). **Radiofrequency Ablation (RFA)** or Microwave Ablation is a minimally invasive procedure that uses electromagnetic energy to kill cancer cells. RFA can be used on patients with a few small tumours. This procedure is done by heating the tumour to a temperature greater than 50°C for more than 5 minutes. Energy is delivered through a small tip of a needle that would be used to penetrate the skin and guided to the tumour. CT imaging or ultrasound technology is used to guide the needle to the tumour. RFA can be performed through the skin or intraoperatively (during operation, combined with surgical resection of the liver).

*Illustration of Radiofrequency Ablation of a Liver Tumour (Intraoperative)*

*Courtesy of: Johns Hopkins University*

*Image source:*

Treating lung metastases

Stereotactic Body Radiation Therapy (SBRT)
This procedure uses specialized external beam radiation to accurately target tumours in the lung that cannot be removed surgically. SBRT uses sophisticated 3D imaging to target cancer cells with intense doses of radiation while minimizing damage to surrounding healthy tissue. The radiation damages the cancer cells stopping the reproduction of cells resulting in the tumour to shrink.

Compared to traditional radiation therapies, SBRT requires no incision, does not interfere with other cancer treatments such as chemotherapy, and can be given in five or fewer daily sessions.

Radiofrequency Ablation (RFA)
RFA is a minimally invasive procedure that uses electromagnetic energy to kill cancer cells by heating the tumour to a temperature greater than 50°C for more than 5 minutes. Energy is delivered through a small tip of a needle that would be used to penetrate the skin and guided to the tumour using CT imaging or ultrasound technology.

Illustration of Radiofrequency Ablation of a Lung Tumour

During RFA, a small tip needle is injected though the patient and directed to the tumour.

Courtesy of: Oncology Nurse Advisor