SURGICAL THERAPIES

IS SURGERY NEEDED WHEN DIAGNOSED WITH COLORECTAL CANCER?

Surgery is the definitive treatment of colorectal cancer. The tumour may be localized, or entered part of the wall of the colon, or the entire wall of the colon. It may have spread to local or regional lymph nodes. Cancer cells from the tumour can travel and spread to other parts of the body through the lymph system. Surgical procedures to remove the tumour will prevent those cancer cells from spreading.

COLON CANCER

In the case of colon cancer, a partial colectomy is a procedure done to remove the tumour, lymph nodes, and some surrounding healthy tissues. When a portion of the colon is removed, an anastomosis is a surgical procedure done to connect the two ends of the colon together to resume healthy bowel function.

Illustration of Resection of the Colon with Anastomosis

During a colectomy, the cancer and surrounding tissue are removed followed by the remaining sections rejoining via anastomosis.

*Courtesy of: National Cancer Institute.*
RECTAL CANCER

In the case of rectal cancer, the surgical technique used is different due to the anatomical location of the rectum. The rectum is tightly enclosed by several other organs making it more difficult to isolate. A Total Mesorectal Excision (TME) procedure is done to remove the sheet of fatty tissue (mesentery) around the rectum. The fatty tissue (mesorectum) that surrounds the rectum contains blood vessels and lymph nodes where part of the tumour can be located.

Illustration of Total Mesorectal Excision for Rectal Cancer


OTHER TYPES OF SURGICAL PROCEDURES

The location of the tumour is what primarily determines what surgical procedure will be performed. There are two main types of surgeries for colorectal cancer: Abdominal Perineal Resection (APR) and Low Anterior Resection (LAR).
Abdominal Perineal Resection (APR)
This procedure removes the lower part of your colon (sigmoid colon), the rectum, and the anus resulting in a permanent colostomy (pouch). APR can be done using different techniques. Open surgery involves making two incisions, one on the abdomen and another in the perineal area (between the vagina and anus or scrotum and anus). Laparoscopy is a minimally invasive technique where several small incisions are made on the abdomen. Small surgical tools and a video camera are inserted into the incisions to remove the cancer.

Illustration of Abdominal Perineal Resection (APR) with Colostomy

During APR, the rectum and anus are removed creating an opening (colostomy).
*Courtesy of: University Health Network Patient Information*
Image source: https://www.uhn.ca/PatientsFamilies/Health_Information/Patient_Family_Education

Low Anterior Resection (LAR)
This procedure removes part of the rectum that contains the cancer. The remaining section of the rectum is attached to the colon (either right away or later) to resume regular bowel movements. Rectal cancer located in the upper part of the rectum near the colon can be removed with LAR. A permanent colostomy is not required if the rectum and colon are reattached.

Illustration of Lower Anterior Resection Procedure
During LAR, part of the rectum is removed followed by the rejoining of the colon and remaining section of the rectum. 

*Courtesy of: National Cancer Institute*

**Colostomy and Ileostomy**

A colostomy or ileostomy is required if the rejoining of the colon and rectum are not possible. A *colostomy* involves the new end of the colon being directed to an opening through the abdominal wall. This opening allows feces and gas to pass through into a bag or pouch attached to the skin. An *ileostomy* involves directing the lowest part of the small intestine (ileum) outside the abdominal wall to create an opening where digested food passes into an external pouching system. A colostomy or ileostomy may be temporary or permanent. If the colon heals sufficiently, a second surgery can be performed to join the two ends of the colon and close the ostomy.

*Illustration of Colostomy and Ileostomy*

![Illustration of Colostomy and Ileostomy](https://intermountainhealthcare.org/services/wound-care/wound-care/conditions/ostomy)

*Courtesy of: Intermountain Healthcare*

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

**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**

Secondary tumours occurring in the liver happens to more than 50% of the colorectal cancer population and liver resection provides the best chances of survival. After surgically removing the tumour, the liver can regenerate itself and may grow back to its normal size within a few weeks. There are two types of surgical procedures used to treat liver tumours: Hepatectomy and Liver Transplantation.
Hepatectomy
Hepatectomy is a surgical procedure where a portion of the liver is removed. This can only be done on patients who have good liver function and are healthy enough to undergo surgery. The patient must have only one tumour present and have no traces of cancer present in the blood vessels. Imaging tests such as CT or MRI with angiography are done to see the size and location of the tumour. If the tumour is too large or the cancer has spread too far, surgery cannot be performed.

Illustration of the Eight Segments of the Liver and Surgical Procedures

Most patients with liver cancer suffer from cirrhosis and depending on the severity, can prevent a patient from getting surgery. Cirrhosis is a disease where the liver cells are damaged resulting in scar tissue. When a tumour gets removed from the liver, the portion remained is responsible for the functions of the entire liver. Leaving behind lots of scar tissue and not enough healthy liver cells would prevent the liver from performing important functions. A reasonable amount (at least 30%) of liver function must be remained once the tumour is removed.
Liver Transplantation
This procedure involves a patient removing their entire liver and receiving a liver from a deceased donor. This is possible when a specific criterion is met. Liver transplantation is the best option when surgically removing part of the liver is not ideal. This procedure is done on patients with small tumours, either one tumour less than 5 cm or three or fewer tumours that are all smaller than 3 cm. The number of donors available is very limited and patients might have to wait a long time for a liver transplant.

Living Donor Liver Transplant*
In a living donor liver transplant, a patient will have their entire liver removed and receive a portion of the liver from a healthy living donor. The donor’s remaining liver will regrow to its normal size, volume, and capacity within a few months. At the same time, the transplanted liver portion will grow and restore normal liver function in the recipient. This approach shortens the wait time for a liver from a deceased donor. An intense screening process is done beforehand to ensure the tissues are a biological match and the chances of rejection by the recipient are minimized.

Illustration of Living Donor Liver Transplant and Liver Regeneration

*An ongoing study is available at the University Health Network (Princess Margaret Hospital) in Toronto, Ontario

Treating Lung Metastases
Surgery is the best option when treating colorectal cancer that has spread to the lungs. Surgeons focus on removing as much of the cancer as possible with the need to preserve the function of the lungs. The number, size, and location of the tumour(s) affect the type of surgery needed. There are four types of surgical procedures: wedge resection, segmental resection, lobectomy, and pneumonectomy.
Wedge resection is a surgical procedure that removes a triangular-shaped slice of tissue in the lung. This procedure removes the tumour as well as a small portion of the lung. Patients with small tumours use this technique. Segmental resection is a surgical procedure that removes a section of a lobe of the lung. The tumour and normal healthy tissue surrounding the tumour are removed. Lobectomy is a surgical procedure that removes one of the lung’s five lobes. This procedure is done when a tumour is found in part of a lung. The right lung has 3 lobes, and the left lung has 2 lobes. Remaining healthy lung tissue will expand to fill the space left by the missing section. Pneumonectomy is a surgical procedure to remove an entire lung that has been affected by the tumour.

Illustration of Different Surgical Procedures to Remove a Tumour in the Lung

Courtesy of: Mayo Clinic