

# The role of the surgeon in cancer care

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## Abstract

The surgeon's role in modern cancer management has evolved beyond that of technician with a scalpel and now encompasses a wide ranging role in diagnosis, counselling, screening, prevention, resource management and palliative care as well as the traditional role of surgical excision. Many surgeons also have an active academic interest at teaching hospitals, conducting cancer research and teaching in associated medical schools. The UK has three established cancer screening programmes for breast, cervical and colorectal cancer, where surgeons are required to perform clinical assessment, diagnostic biopsies and plan surgical treatments. The multidisciplinary team remains the cornerstone of cancer treatment in the UK and each oncological subspecialty has regular meetings to discuss tailored cancer treatment for each individual. Alongside oncologists, radiologists, specialist nurses and pathologists, the surgeon is a key member of this team and in the decision making process. There are many different surgical techniques available for surgical treatment of cancer, many of which allow a minimally invasive approach including laparoscopic, endoscopic and robotic surgery. The progress of medical genetics and gene profiling now allows identification of 'at-risk' individuals for specific types of cancer where prophylactic or risk reducing surgery may be of benefit. Cancer treatment may result in disfigurement and loss of function, so reconstructive surgery is now an integral part of cancer management. Patients with advanced disease can often be helped by surgery to relieve symptoms and improve the quality of their remaining life and so the surgeon may play a key role in end-of-life care.

**Keywords** Cancer; diagnosis; palliation; prevention; reconstruction; screening; staging; surgery

## Introduction

Cancer continues to be a leading cause of mortality in the UK and worldwide, with 14.1 million new cases and 8.2 million deaths per annum globally. Although traditionally thought of as a disease of Western society, the incidence of cancer continues to grow worldwide, with 57% of new cancer cases and 65% of all cancer deaths occurring in less developed countries. In the UK cancer incidence rates have increased from 560 per 100,000 in 1995 to 604 per 100,000 in 2015.<sup>1</sup>

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Breast, prostate, lung and colorectal cancer account for just over half (53%) of all new diagnoses in the UK in 2015 as shown in Table 1.

Cancer remains a disease of an ageing population. Cancer occurring in the young is largely rare, with those aged 0 to 24 accounting for just 1.1% of new cancer diagnoses, whereas those aged 65 and over accounted for 65.2% of new diagnoses.<sup>1</sup>

In the 21st century surgeons continue to play an important role in the management of cancer patients. The scope of the surgeon has expanded to include involvement in screening programmes, diagnosis and staging, curative resection, risk-reducing surgery, reconstruction and symptom control in palliation.

Treatment of all patients with cancer in the UK is now coordinated via multidisciplinary teams (MDT), where patient management is discussed and decided by a group of experts including surgeons, radiologists, pathologists, oncologists and specialist nurses. Regular meetings of these teams have been shown not only to improve consistency in the quality of treatment plans, but to provide tailored treatment appropriate to each patient rather than the disease, often across different surgical disciplines.<sup>2</sup> The MDT approach has a proven impact on improving patient morbidity and survival.<sup>3</sup> Additionally, sub-specialization and centralization of services for certain cancer subtypes is well developed within UK practice, with proven improvements in patient care and outcomes.<sup>4</sup>

## Diagnosis

Cancer diagnosis can be challenging and requires a combination of clinical and family history, physical examination, radiological imaging and histological assessment. As part of this process surgeons play an important role, not only in initial patient assessment, but also in the process of obtaining a tissue biopsy for histological diagnosis. Many centres now offer a 'one-stop' service where patients referred into clinic by GPs are seen by a surgeon, undergo appropriate imaging and have tissue sampling on the same day if necessary. This has a positive impact on the patient's experience and improves efficiency by reducing waiting times for cancer and costs.

Some examples of tissue sampling techniques utilized are:

- **Fine needle aspiration (FNA):** a needle on a syringe is inserted into the area of interest either by palpation or under ultrasound guidance to aspirate fluid and cells for analysis. FNA has limitations such as lack of tissue architecture for a definite diagnosis, high false negative and

## Worldwide and UK incidences of cancer<sup>1</sup>

Incidence	Worldwide (2012) (millions)	UK (2015)
New cases	14.1	300,000
Deaths	8.2	163,500
Lung	1.82 (13%)	37,600 (12.5%)
Breast	1.68 (11.9%)	46,000 (15.3%)
Colorectal	1.35 (9.7%)	34,700 (11.6%)
Prostate	1.1 (7.8%)	40,300 (13.4%)

Table 1

false positive rates in certain cancer subtypes. However, it remains valuable in the initial investigation of thyroid lumps where larger volume biopsy is not feasible.

- **Core biopsy:** biopsies are obtained using an automated spring-loaded firing device. The device is inserted into the area of interest after infiltration with local anaesthetic and excises a small cylinder of tissue within the needle channel. This method retrieves tissue for analysis, maintaining the tissue architecture for histological diagnosis (cf. FNA). Core biopsies can be taken clinically for palpable lesions or may be performed under image guidance (ultrasound, CT, MRI, or stereotactic mammography).
- **Vacuum-assisted biopsy devices (VAB):** this technique has been used in the setting of breast cancer and is used for diagnostic and occasionally therapeutic purposes. Although relatively costly compared to other techniques, VAB allows larger and multiple samples to be obtained with a single insertion, thus reducing the sampling error and can completely remove the lesion under real-time ultrasonic or X-ray guidance. In non-aggressive low volume cancers, this technique may be curative by completely excising the lesion.
- **Excisional and incisional biopsy:** an incisional biopsy aims to remove only a section of the tumour and is usually performed when other methods of sampling have failed to reach a definite diagnosis. Punch biopsies may be used to diagnose skin lesions such as suspected melanomas or skin metastasis. Excisional biopsies are used in cases where diagnostic uncertainty exists and it is possible to remove the entire tumour with minimal risk to the patient. This can commonly be the case with melanoma and also with small indeterminate breast lesions where other methods of sampling have failed to provide an accurate pathological diagnosis. If a diagnosis of cancer is made after an excisional biopsy, further surgery may be required to re-excise the margins of the tumour bed to allow for adequate oncological clearance. Surgeons may be called upon by haematologists to perform excision biopsy of lymph nodes so that the pathologist is given enough tissue for specific diagnosis and characterization of lymphomas to guide therapy
- **Endoscopic biopsy:** biopsies can be obtained during endoscopic procedures, using either rigid or flexible scopes. Instruments can be passed down the centre of an endoscope to obtain tissue. This is the routine method of tissue diagnosis in colorectal, bladder, upper GI and ENT cancers. Tissue can be taken with standard biopsy forceps or, in the case of polyps, with a snare for larger polypoid lesions such as colorectal polyps. This will often be attached to diathermy to reduce post biopsy bleeding. Endoscopic biopsies are the gold standard for cancers affecting luminal structures since the cancers can be directly visualized, photographed, biopsied and, in the case of colorectal cancers, tattooed in order to improve identification at subsequent operations. The use of endoscopic USS for imaging as well as biopsy is now widely used in regions of the body that have been traditionally difficult to access such as the pancreas.

Many of these biopsies are now routinely carried out under radiological guidance usually by CT or USS. This is safer as it reduces the chances of iatrogenic injury to surrounding structures and increases the likelihood that the lesion of interest will be targeted successfully by biopsy.

### Staging

After a tissue biopsy confirms the diagnosis of cancer, staging of the disease helps to predict the prognosis of the disease and plan treatment in the form of surgical resection, with or without adjuvant therapy in the form of chemotherapy, radiotherapy and endocrine therapy. Although a vast amount of staging is based upon radiological assessment with cross-sectional imaging, there are some circumstances in which surgeons are involved:

#### Sentinel lymph node biopsy (SLNB)

This technique is now used commonly in the management of breast cancer, melanoma and, to a lesser extent, in the management of other cancers such as gastric, oesophageal, head and neck, penile, vulval and anal cancers. A combination of radioisotope (often technetium-99) and patent blue dye are injected at the site of the tumour in order to help identify the first (sentinel) lymph node receiving lymphatic drainage from the tumour, which can then be excised and sent for histological examination. The identification of a positive sentinel lymph node (lymph node containing cancer cells) gives important prognostic information on more advanced disease and identifies those patients that will need further treatment such as lymph node clearance or adjuvant chemotherapy or targeted radiotherapy. Similarly, the finding of a negative sentinel lymph node in the setting of breast cancer indicates a 95% chance of the remainder of the lymph nodes within that lymph node basin being free of tumour and it subsequently eliminates the need for further invasive therapy and its associated morbidity.

#### Diagnostic and staging laparoscopy

These minimally invasive techniques can be used for diagnosis, staging and treatment for cancers that are intraperitoneal and intrathoracic. Laparoscopy can provide a route to biopsy a lesion which is otherwise inaccessible (such as intra-abdominal lymph nodes), where the diagnosis of cancer is uncertain or the staging of a cancer is in question.

In the context of intra-abdominal malignancies, there are circumstances where staging with radiological techniques such as ultrasound, CT and MRI have their limitations. This can sometimes make it difficult to identify patients suitable for curative resection from those with inoperable disease. In these situations a diagnostic laparoscopy offers a valuable method of assessing the stage of the disease. This is often the case with upper gastrointestinal malignancies, such as gastric, pancreatic and cholangiocarcinomas as well as ovarian cancers. In these cases, laparoscopy is sometimes the only way to assess the local spread or determine the presence of intraperitoneal disease. Resection of these cancers can lead to extensive morbidity so it is important to ensure that these patients do not have an inappropriate operation for inoperable disease (e.g. metastatic pancreatic cancer) or that they get appropriate neoadjuvant chemotherapy where appropriate.

Laparoscopic ultrasound can be used in liver surgery if resection of colorectal liver metastases is proposed, as intra-operative ultrasound can give much more information regarding the size, number, location and local involvement of liver metastases, than cross sectional imaging alone.

### Surgical treatments

Despite advances in systemic treatments, surgical excision is often the primary treatment for many cancers and for many patients it is the surgery that is the most important part of their treatment and gives the best chance of resulting in a cure. Whether a cancer is amenable to curative resection depends on the tumour location, its extent and its involvement with surrounding structures. Many cancers are now treated by surgery and either neoadjuvant treatments (i.e. prior to surgery) or adjuvant treatments (i.e. after surgery).

Successful resection involves removal of the tumour in its entirety, leaving no residual disease, without compromise to organ function or patient quality of life. In reality, this cannot always be achieved and occasionally a compromise exists between these two factors. As a result, in order to preserve organ function or prevent excess morbidity, there may be circumstances where microscopic disease remains at the margins of resection. Although this is deemed less ideal oncologically, with the addition of adjuvant radiotherapy and/or chemotherapy there is growing evidence to suggest that prognosis in terms of survival and disease-free survival improves<sup>5</sup> and remains good in certain cancers indicating that resection of colorectal liver metastases may be appropriate even if complete resection is not feasible.<sup>6</sup> De-bulking surgery, where macroscopic tumour is left behind following resection, is performed less frequently and reserved for certain circumstances, usually in the palliative setting where remaining quality of life may be improved by reducing tumour volume. This is particularly true of tumours involving the GI and biliary tracts where bypass surgery can improve symptoms in palliation.

Traditional open surgery remains common, and is sometimes the only method of surgical treatment, but minimally invasive options are becoming more acceptable and readily available.

These include:

#### Laparoscopic/thoracoscopic surgery

This is now a well-established mode of surgery where examination of the abdominal/thoracic contents is established by a pneumoperitoneum/pneumothorax created with carbon dioxide insufflation and a high definition camera is inserted into the abdomen/thorax through a small port site incision. The operation then proceeds through the application of instruments inserted through separate port site openings in the abdominal/thoracic wall. This method of surgery is being increasingly used for treatment of a variety of intra-abdominal and intrathoracic malignancies, including colorectal, gastric and lung tumours, and although initial doubts had been cast on its oncological safety and ability to achieve adequate resection, these have been mostly laid to rest with the release of subsequent reassuring data.<sup>7</sup>

#### Single incision laparoscopic surgery (SILS)

This is a modification of conventional laparoscopic surgery where a single port site incision is made into the abdomen and both the viewing camera and instruments are inserted through the same incision. Although this technique has been used successfully for non-oncological procedures such as appendectomy in the USA, its uptake for cancer resections is slow due its technical challenges and concerns regarding oncological safety.<sup>8</sup>

#### Endoscopic surgery

Colorectal cancers are known to arise from pre-existing colonic polyps that undergo malignant transformation. Early stage tumours affecting only the submucosa (T1) are therefore frequently present within part of a polyp found at endoscopy. Some of these early stage tumours are now being excised at the time of endoscopy, removing the necessity for general anaesthetic and formal bowel resection. For polypoidal lesions of the rectum simple diathermy assisted snaring of the lesion is often employed. For villous adenomas and adenomatous lesions which have no 'neck' for snaring, TEMS (transanal endoscopic microsurgery) can satisfactorily remove such lesions with adequate margins negating the need for larger, more morbid operations. In the case of Barrett's oesophagus most centres now offer radio-frequency ablation (RFA) during upper GI endoscopy.

#### Robotic surgery

This mode of surgery is the newest to emerge on a wide-scale level. Robotic surgery was developed to overcome some of the limitations of other minimally invasive techniques, and allows the surgeon to control the instruments of the robot via a console either within the operating theatre itself or remotely. Surgeries have now been successfully completed where the surgeon is in a different continent from the patient. The instruments aim to give greater dexterity and precision of movement compared to conventional laparoscopic instruments. Although this type of surgery remains fairly new it has been used in cancer resections for colorectal and thyroid cancer as well as others, but its main uptake has been in relation to radical prostatectomy for prostate cancer, with the ability to dissect and operate within a confined space being a definite advantage over other techniques.<sup>9</sup>

#### Other techniques

There are other relatively new techniques that have been developed and are often used in specialized situations and institutions. These include gamma knife radio surgery, cryosurgery, microwave ablation and high-intensity focused ultrasound (HIFU). Most of the techniques generate localized changes in temperature which can destroy cancer cells. Surgeons may be involved in providing access to the tumours so that such technology can be applied.

#### Screening

In the UK, surgeons are involved in the three national screening programmes for breast, cervical and bowel cancer. As part of the breast-screening programme in the UK, all women aged between 50 and 70 years are invited to undergo a mammogram on a 3-yearly basis, with ongoing trials investigating extending the

screening age range from 43 to 73 years. As part of this programme, surgeons are involved in the assessment of patients recalled for further investigation following an initial abnormal mammogram, perform diagnostic biopsies and operate on those diagnosed with cancer through screening.

The UK colorectal screening programme started in 2006 and offers screening, 2-yearly to men and women aged 60–75 years (50–75 in Scotland) by faecal occult blood tests through the post. Those patients with an abnormal result will then have a screening colonoscopy to identify polyps and cancers.

Gynaecologists are involved with the cervical screening programme for women between the ages of 25 and 64 years. This is done by cervical smears every 3–5 years. An abnormal smear will be followed by colposcopy and further treatment as necessary.

In addition to the national screening programmes, individuals who are identified to be at increased risk of a particular cancer, because of their family history or past history, may be enrolled on bespoke screening programmes at a younger age than the routine screening programmes. Examples of these include young female patients known to carry *BRCA* or *TP53* genes who undergo annual MRI breast screening and families with Lynch syndrome or FAP undergoing regular colonoscopy from an early age.

There is currently no national prostate cancer screening programme. The use of PSA (prostate specific antigen) as a screening tool as its unreliability is felt to lead to an unacceptable increase in over-diagnosis and over-treatment when used in a screening program. This remains controversial and is the subject of research and debate. Men over 50 who are concerned about prostate cancer can however ask their GPs for testing as part of The NHS Prostate Cancer Risk Management Programme (PCRMP).

Screening for abdominal aortic aneurysms (AAA) is recommended for all men over 65 and for those over 55 with a positive family history. This is carried out by a one off abdominal ultrasound with tailored ultrasound follow up depending on the presence and size of any detected aneurysm. Surgeons should be adept in discussing the negative impacts of screening such as over-diagnosis and over-treatment which all patients should be made aware of before making a decision to undergo screening.

### Cancer prevention

It has long been widely understood that certain cancers show genetic tendencies and cluster within certain families, but modern techniques now allow clinicians to identify those individuals that carry specific genes predisposing them to a higher risk of developing cancer. This information often poses challenging dilemmas for clinicians and asymptomatic individuals who have to consider the evidence and decide what management is appropriate for them in these situations. The surgeon's role is to provide as much information as possible and to support patients as they consider the options available to them. The timing of intervention can have huge implications on fertility and well as body image.

The modern surgeon should also actively engage in promoting and supporting a healthy lifestyle with smoking cessation advice or referral to weight loss programs where appropriate.

For hereditary familial cancer see pages 228–233 of this issue.

### Reconstruction

Treatments for cancer can often result in body disfigurement or loss of function. This has a significant impact on patient well-being and quality of life. Reconstructive surgery can improve and/or restore the anatomy, function and cosmesis for a cancer patient following their treatment. Reconstruction plays a part following the treatment of a number of cancers including head and neck cancers where restoration of functions such as swallowing, speech and mastication are fundamental to quality of life. Radical excision of some sarcomas may require use of myocutaneous flaps or reconstructive limb surgery to restore function.

In colorectal cancer requiring excision of the rectum, patients will often suffer debilitating frequency and urgency of bowel motions. This can be mitigated to an extent by formation of a pouch. This is an internal reservoir surgically constructed from loops of small bowels stitched or stapled together. This restores some level of voluntary bowel opening to the patient and improved quality of life.

In the modern management of breast cancer, cosmesis has become very important and has led to the development of oncoplastic breast surgery. All breast surgeons should be trained in oncoplastic techniques and consider the cosmetic outcome of excisions and learn techniques to minimize the deformities and offer methods of breast reconstruction when mastectomies are needed or requested. Although oncological clearance is always the primary aim of surgery and should not be compromised, the role of reconstructive surgery has now changed the approach taken by many surgeons in order to achieve good cosmesis, alongside oncological clearance, Neoadjuvant treatments of a number of cancers may also decrease tumour volume and subsequent surgery may be less mutilating, without compromising the risk of recurrence. For instance in breast surgery large volume tumours requiring mastectomy can often be treated with neoadjuvant chemotherapy in order to shrink them to a volumes amenable to wide local excision. Larger tumours which would have traditionally required a mastectomy can now be treated with a therapeutic breast reduction (mammoplasty).

### Cancer follow-up

Following treatment for a cancer, follow-up is often in the region of 5 years for most cancers. This is carried out predominantly in the outpatient setting and is coordinated most often by surgical teams. This will be in the form of regular imaging, blood tests alongside history and examination by the surgeon or clinical nurse specialist. In the early stages this provides an opportunity for patient support following arduous treatment as well as management of complications. In the long term this acts as surveillance to monitor for disease recurrence and often the bond and trust between a patient and their surgeon will become very strong as the years progress, often to the point where patients are very reluctant to be officially discharged at the end of the follow up period.

## Palliation and symptom control

Surgery remains a treatment option for cancer patients in the setting of incurable disease and within the context of palliation. Although not an option in all settings, surgery may be considered for symptom relief in a number of specified situations where less invasive strategies have failed. Intestinal bypass procedures, colonic stents and diverting stomas may be an option in cases of bowel obstruction due to intraluminal or extrinsic compression from intra-abdominal malignancy. In upper GI malignancy, oesophageal and biliary stenting can be considered to relieve symptoms of dysphagia and jaundice, whereas duodenal stenting or surgical bypass may help relieve symptoms of gastric outlet obstruction due to extrinsic compression from gastric or pancreatic cancer. In all cases where surgery is considered in the palliative setting, careful consideration must be given to weighing up the potential benefits of the procedure against its risks. In these complex scenarios the input from the designated hospital and/or community palliative care team is invaluable not only with regard to decision making as part of the MDT, but also in terms of providing physical and emotional support for the patient and their family.

## Conclusion

Surgeons continue to play a key role in the management of malignant disease as part of a multidisciplinary team. The scope of surgery has increased as new methods of detection, prevention and treatment are developed. ◆

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## FURTHER READING

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