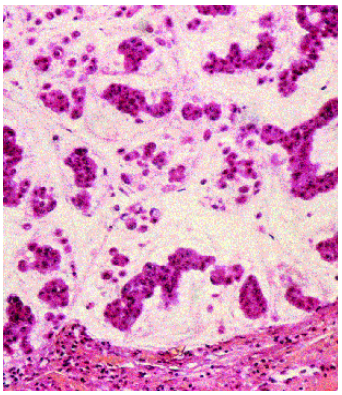

Light micrograph of a section of a mucinous adenocarcinoma (purple lobes) of the large intestine. Healthy tissue (pink) is seen at bottom and right

Pseudomyxoma peritonei

AUTHOR **Gary Witham, GN, BA,** is a clinical nurse specialist (pseudomyxoma), Christie Hospital NHS Trust, Manchester.

ABSTRACT **Witham, G. (2003) Pseudomyxoma peritonei. *Nursing Times*; 99: 39, 30–32.**

Pseudomyxoma peritonei is a rare, slowly progressive disease that produces extensive mucus accumulation within the abdomen and pelvis. It is managed by cytoreductive surgery involving hyperthermic intraoperative intraperitoneal chemotherapy.

In November 2002 the National Specialist Commissioning Advisory Group (NSCAG) agreed funding for the Christie Hospital in Manchester to be the second centre in the country registered to treat the rare condition pseudomyxoma peritonei. The NSCAG was established in 1996 to advise the government on identification and funding of patient services that required central intervention to ensure equity of access, clinical effectiveness and/or economic viability (NSCAG, 1998). The North Hampshire Hospital at Basingstoke became the first NSCAG centre in 2001.

Epidemiology and disease process

Pseudomyxoma peritonei is a slowly progressive disease that produces extensive mucus accumulation within the abdomen and pelvis (NSCAG, 2002). There are three pathologically and prognostically distinct groups of peritoneal mucinous lesions.

- The classic lesion is described histologically as a diffuse benign mucinous epithelium associated with an adenoma of the appendix, which is associated with fibrosis.
- The second group has the pathological features of a disseminated carcinoma with a poor prognosis and should be diagnosed as 'disseminated peritoneal mucinous carcinomatosis'.
- The third group includes those uncommon cases with pathological features that have similarities with both of the above groups. These cases are usually associated with primary well differentiated mucinous adenocarcinomas of the appendix (Ronnett et al, 2001).

Classic pseudomyxoma

In true pseudomyxoma an adenoma grows within the appendix and occludes the lumen of the appendix. The appendix eventually ruptures, leaking mucous containing epithelial cells into the abdominal cavity. After the appendix decompresses the perforation may reseal, only to extrude more adenomatous epithelial cells at a later time. Sometimes neither a primary appendiceal tumour nor a normal appendix is apparent. In these cases it may be that the appendix has ruptured and has been obliterated by the developing fibrosis.

Pseudomyxoma peritonei is often referred to as a 'borderline malignant' condition. The tumour is not biologically aggressive because it does not metastasise via the lymphatics or bloodstream like gastrointestinal adenocarcinomas. However, it is still a fatal process. The space required within the abdomen and pelvis for nutritional function eventually becomes replaced by a mucinous tumour. Most of these tumour cells are surrounded by fluid of varying consistency.

Bulky cellular deposits are usually found within the omentum and beneath the right hemidiaphragm. Gravity creates a further accumulation of adenomucinous cells within the pelvis where the peritoneum reflects over the pelvic organs.

Anatomy

Common sites involved in tumour dispersion include the stomach, the area around the terminal ileum and the rectosigmoid colon within the pelvis (Fig 1). All three of these sites are fixed to the retroperitoneum and are not free to move as a result of peristaltic activity. The peristaltic activity of the small bowel may prevent mucinous tumour implantation on these surfaces, resulting in relative sparing of the small bowel.

Signs and symptoms

The predominant feature of pseudomyxoma peritonei is a gradual increase in abdominal girth. The increase in girth intensifies pressure on the gut and prevents the patient from eating normally. Despite this the patient often notices an increase in body weight.

The symptoms of pseudomyxoma can be non-specific and are often misdiagnosed. The disease is often an unexpected finding of investigations of non-specific abdominal symptoms, an ultrasound/computerised tomography scan, or after an abdominal operation. Diagnosis can be difficult because mucinous tumours may be present in the gastrointestinal tract, gallbladder and ovaries. Women with disseminated peritoneal adenomucinosis (pseudomyxoma) and peritoneal mucinous carcinomatosis often have ovarian involvement with a mucinous tumour.

The ovarian tumour is frequently the presenting clinical symptom and is often assumed to be the primary site, therefore no attempt is made to identify the appendix as a possible source of the mucinous tumour.

In some cases the primary tumour in the appendix can be quite inconspicuous in relation to an abundant mucinous peritoneal tumour. In addition, rupture and fibrosis can obliterate the appendix and ovarian tumours are often interpreted pathologically as primary mucinous borderline malignant tumours.

This happens particularly when the appendix has not been removed but can even occur when an appendiceal adenoma is identified. There is evidence that the ovarian

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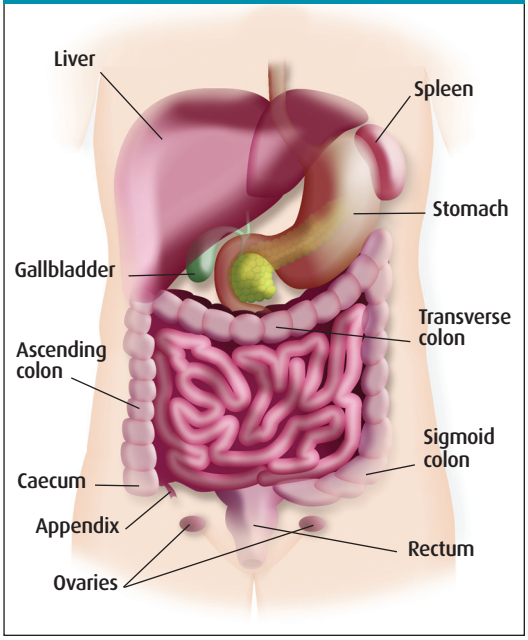
FIG 1. POTENTIAL SITES OF TUMOUR



mucinous tumours in pseudomyxoma peritonei are on the surface of the ovary and are secondarily derived from the associated appendiceal mucinous tumour.

Treatments and side-effects

There are three approaches in the management of pseudomyxoma peritonei: watch and wait (where the patient is monitored closely), chemotherapy and surgery.

Chemotherapy

The commonly used forms of chemotherapy (oral or intravenous) have very little role at the benign end of the spectrum. This is because the disease is of borderline malignancy and may have a very poor blood supply, so chemotherapy does not gain access to the cells. For a low-grade tumour the risks of treatment far outweigh the benefits. Most oncologists consider that chemotherapy has no place in the management of early pseudomyxoma peritonei. However, intestinal-type chemotherapy sometimes has beneficial effects if the tumour has features of mucinous adenocarcinoma.

Traditional surgical approach

The traditional surgical approach is debulking, which involves removing as much of the tumour as possible. Debulking generally includes removing the uterus and ovaries in women and often the right colon and the omentum. Recurrence is almost inevitable because of residual disease around the peritoneal cavity.

Repeat debulking surgery may be possible on a number of occasions but each attempt becomes more difficult and dangerous. The small bowel becomes increasingly involved as a result of adhesions and eventually surgery becomes fraught with severe complications such as small bowel fistulae.

Cytoreductive surgery

Another method used is cytoreductive surgery, which refers to the aggressive removal or destruction of all visible tumours present throughout the peritoneal cavity. Peritonectomy procedures involve stripping the parietal peritoneum and resecting structures at fixed sites that contain adenomucinosis (Glehen et al, 2003; Sugarbaker, 2001). This can be accomplished by removing or destroying the tumour using a combination of surgical techniques. These include organ resection and tumour destruction using electro-evaporation and argon beam coagulation. The operation comprises a number of different procedures including:

- Right hemicolectomy, colectomy, removal of rectum and sigmoid (anterior resection);
- Greater omentectomy;
- Splenectomy;
- Cholecystectomy;
- Lesser omentectomy;
- Pelvic peritonectomy, which sometimes includes the rectum by anterior resection and in the female includes removal of the ovaries and uterus;
- Stripping the peritoneum from left hemidiaphragm;
- Stripping the peritoneum from right hemidiaphragm;
- Stripping disease from the surface of the liver.

The long-term results depend upon the extent to which the tumour can be removed during surgery. The smaller the residual tumour deposits the greater the chance the tumour will respond to chemotherapy. Cytoreductive surgery is an extensive, lengthy procedure that lasts on average more than 10 hours. If complete tumour removal has been possible, intraperitoneal chemotherapy has been given and the tumour is at the benign end of the spectrum, then 50–80 per cent of patients will survive for 10 years. After cytoreduction, hyperthermic chemotherapy is administered directly into the peritoneal cavity.

Hyperthermic chemotherapy

After cytoreductive surgery, closed suction drains are placed through the abdominal wall and sutured and temperature probes are secured to the skin edge. The skin edges are then secured to a retractor ring and a plastic sheet is stapled to create an open space beneath. Chemotherapy is administered in dianeal fluid.

The peritoneum-plasma barrier allows a high concentration of drugs to be administered directly to the abdominal and pelvic surfaces where the tumour is located. The chemotherapy used is based on the drug's ability to produce a cytotoxic effect over a short time period (90 minutes in theatre) and to have an increased response with heat. The use of heated intraoperative intraperitoneal chemotherapy after complete dissection of adhesions and before anastomoses are completed allows optimal perfusion of the chemotherapy to the peritoneal surfaces and organs.

Hyperthermia itself also has a direct cytotoxic effect (Christophi et al, 1998). Mitomycin C is frequently the drug of choice because it has a slow clearance from the

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peritoneal cavity. Pharmacokinetic studies of intraoperative intraperitoneal chemotherapy report absorption of 75–90 per cent of mitomycin C within the first hour. Chemotherapy agents used should have a large molecular weight and be water soluble. They must clear from the systemic circulation quickly and their toxicity must be enhanced by hyperthermia (Witkamp et al, 2001).

After theatre, early postoperative intraperitoneal chemotherapy may be useful as a supplement to heated intraperitoneal chemotherapy. This involves one litre of intraperitoneal fluid containing chemotherapy (usually 5-fluorouracil) administered via an abdominal catheter and kept in situ for 23 hours.

The drains are closed over this period. The abdomen is then drained for one hour until the next chemotherapy infusion. This process lasts for five days. Some patients may experience discomfort during infusion of the intraperitoneal fluid.

Further surgery requirements

Complete cytoreduction carries a mortality risk of 1.5 per cent (Stephens et al, 1999). The main complications are cardiorespiratory failure and there is also a risk of deep vein thrombosis, which can result in pulmonary embolus. Surgery also has a significant morbidity of approximately 30 per cent.

It has been found that approximately 20 per cent of patients require further surgery to deal with the complications of the primary operation during the same admission and approximately 20 per cent of patients require a stoma. A permanent stoma is needed if all or most of the colon has to be removed.

A temporary stoma is usually necessary when the rectum has to be removed and the join, although appearing intact at the time of surgery, has a very high risk of leakage because of its position and because intraperitoneal chemotherapy is used. The temporary stoma is usually closed three to six months after the primary operation.

Postoperative complications

Most side-effects result directly from having the operation rather than from the chemotherapy. Mitomycin C is usually used in theatre and 5-fluorouracil is mainly used soon after surgery.

The major side-effects of these drugs are nausea and vomiting. However, these side-effects can also be induced by surgery and can be controlled by antiemetics and a nasogastric tube.

The patient may have a greater risk of infection in the abdominal cavity after the procedure (peritonitis), as well as a delay in the healing process. Diarrhoea and lethargy may also occur but are more likely to be the result of major surgery rather than the chemotherapy.

Watery eyes, sore mouth and sore skin on the hands and feet are potential, though rare, side-effects of chemotherapy. Most of the chemotherapy stays in the abdomen rather than travelling systemically – therefore most of the potential side-effects relate to the abdomen. However, there may be bone marrow suppression, causing leucocytopenia and thrombocytopenia, as a result of intraperitoneal chemotherapy and this is dependent on the drug used and its dosage.

Perioperative care

Nursing care within the perioperative stage is important to maintain safety in the administration of chemotherapy. Mitomycin C is added to one litre of warmed dianeal fluid using an aseptic technique. The drug label is attached to the bag from the syringe. To prevent spillage of the heated chemotherapy and to control potential chemotherapy vapours, a plastic sheet is stapled in place by the surgeon to allow enough room for the adjustment of cannulae and suction while preventing vapour escaping into the atmosphere. To prevent theatre staff inhaling these vapours a suction machine is used to evacuate vapours under the plastic sheet (this may also be used for smoke extraction during the rest of the operation). This method presents no risk to the surgeon or other operating room personnel (White et al, 1996).

Routine theatre clean-up procedures are safe and effective if perioperative personnel adhere strictly to universal precautions. Perioperative personnel should separate any chemotherapy-contaminated material using disposable gowns and drapes and place the waste in sealable bins for incineration.

After 90 minutes of chemotherapy perfusion in the abdomen the nurse or perfusionist flushes out mitomycin C into a sealed disposable system, which is then placed directly in a bin for incineration.

Postoperative care is carried out initially in intensive care and then in a high dependency unit. Nursing care is similar for any patient undergoing major abdominal surgery. If the patient is having early postoperative intraperitoneal chemotherapy there may be a tendency for leaking around the abdominal catheter site. Protocols should be in place to deal with cytotoxic leaking. It is important to use aseptic techniques when cleaning around the catheter because there is an increased risk of peritonitis when using regional chemotherapy.

Conclusion

The management of pseudomyxoma peritonei has changed from a traditional debulking surgical procedure to cytoreductive surgery involving hyperthermic intraoperative intraperitoneal chemotherapy and, for some patients, early postoperative intraperitoneal chemotherapy. Changes in surgical technique, including stripping of peritoneal surfaces, have provided a viable alternative to debulking and allow the use of intraperitoneal chemotherapy and a curative approach to this disease.

Nursing these patients offers an opportunity to engage with people living with a rare tumour. The dissemination of information to both health care professionals and patients and carers provides a challenge in an area of limited available research. This limitation also provides an avenue to work with patients to explore areas of concern and to begin to map care pathways to improve the quality of life for these patients. ■