A nursing update on cytotoxic chemotherapy

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Introduction

The modern era of cytotoxic chemotherapy started during World War II when a cargo ship carrying mustard gas exploded. Many who survived the blast died in the following weeks because their bone marrow had been destroyed by the gas. Mustine, the first cytotoxic chemotherapy drug produced after the war, was a variant of mustard gas, and was found to be dramatically effective in the treatment of Hodgkin's disease, which was previously untreatable.[1]

Cytotoxic (derived from the Greek word, *kytos,* meaning "cell") agents exert their action nonselectively. In other words, they cannot discriminate between normal and malignant cells on rapidly dividing cells in the body.

It is essential to have insight into the five phases of the cell cycle in order to understand the principles of cytotoxic administration, the side-effects and care of the patient undergoing chemotherapy.

General classification of cytotoxic agents

Cytotoxic agents are generally classified as polyfunctional alkylating agents, antimetabolites, plant alkaloids, antibiotics, hormones/steroids and miscellaneous therapeutical agents, also referred to as "biologics".[2,3]

Polyfunctional alkylating agents

Polyfunctional alkylating agents, also known as antimitotic drugs, act within the nucleus of the cell, and alter the DNA molecules, resulting in the inhibition of cell growth and reproduction.

Antimetabolites

Antimetabolites resemble substances which are essential to cellular activity, and which are therefore taken up by the cells. These preparations are sufficiently different from normal metabolites, so as to alter cell metabolism and inhibit growth and reproduction.

Figure 1: The familiar Periwinkle plant from which the cytotoxic agent, Vincristine®, a plant alkaloid, derives[4]

Plant alkaloids

The plant alkaloids currently in use derive from the Periwinkle plant (Figure 1). They block cell reproduction during metaphase, i.e. the second stage of division of the cell nucleus.

Antibiotics

Certain antibiotics have been found to be of value in inhibiting some types of tumour cells. They act by interfering with the DNA and/or RNA of the cells.

Hormonal or endocrine manipulation

Hormones change the chemical environment of the tumour cells and inhibit the synthesis of vital enzymes and/or the action of those hormones which influence tumour growth. Examples include oestrogen, androgen (e.g. testosterone) and the adrenocorticosteroids. The latter are commonly used for breast, uterus, prostate and thyroid cancer because they

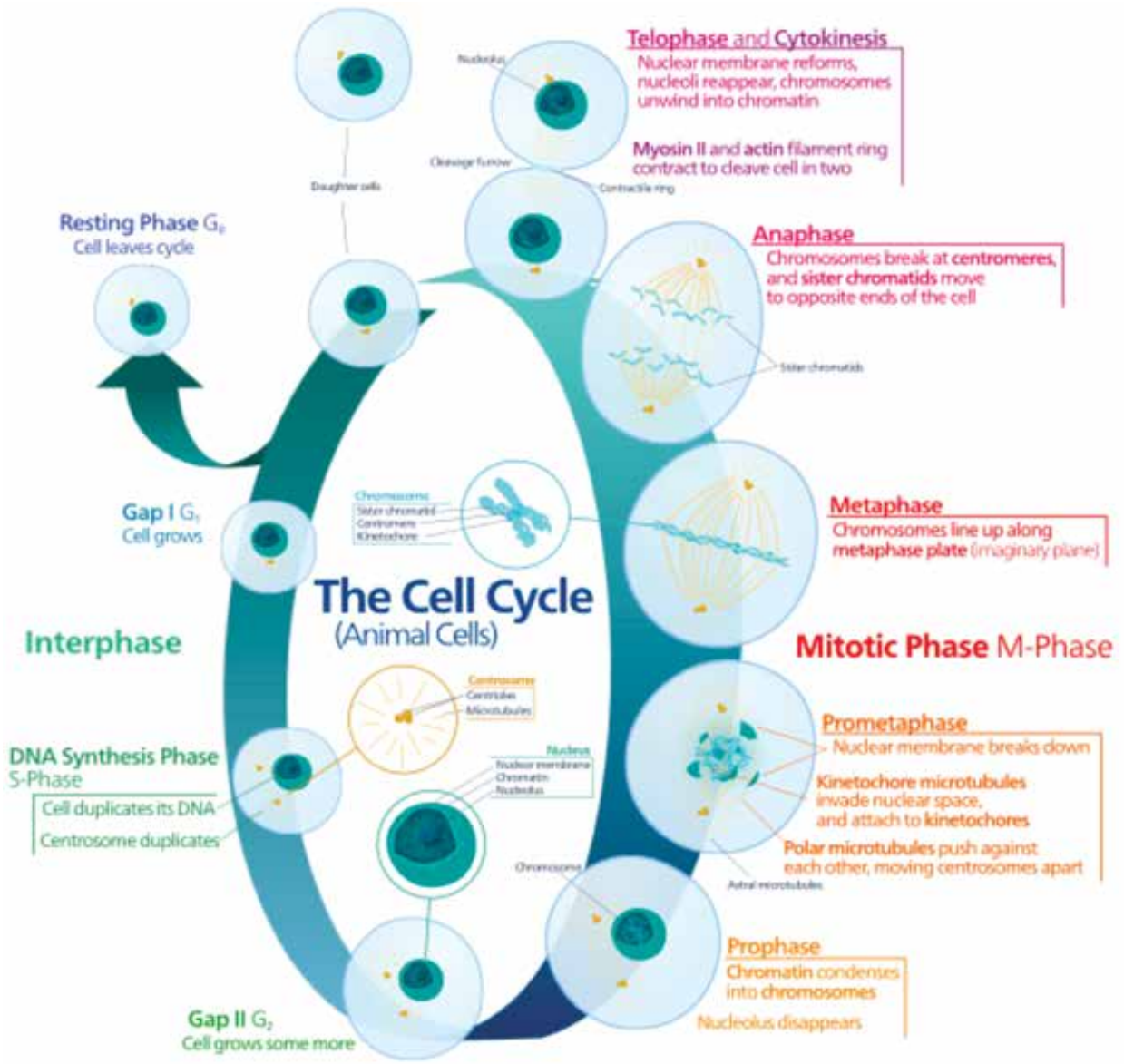

Figure 2: The cycle of cell division[5]

suppress cell reproduction through the inhibition of cellular protein synthesis.

Immunotherapy and immunostimulants

Immunotherapy and immunostimulants, also known as "biological therapy", are the most recent and exciting area of research and development. Usually given as adjuvant (i.e. supportive) therapy, biologics also stimulate the body's immunity and the growth of normal cells, especially the bone marrow cells, when they have been damaged by chemotherapy.

Biological therapy includes the use of vaccines (e.g. the bacille Calmette-Guérin vaccine) and interferon used in the treatment of malignant melanoma and some leukaemia, as well as monoclonal antibodies. If the name of a chemotherapeutic agent ends in "mab", this usually indicates that it is a monoclonal antibody.

The cell cycle and cytotoxic chemotherapy

All cells, whether normal or malignant, pass through the following stages of mitosis (Figure 2):[2]

- *G_1 phase:* The initial phase of the cell cycle, where enzymes required for cell function and DNA synthesis are produced
- *S phase:* DNA (the "genome" or genetic blueprint material for that cell) is replicated in preparation for cell division
- *G_2 phase:* Further growth of the cell and synthesis of the essential cell components occurs
- *M phase (mitosis):* The cell divides into two identical "daughter" cells
- *G_0 phase (also known as "interphase"):* A rest period before the cell enters the next cycle of division.

Mode of action of the cytotoxic agents

Cytotoxic drugs act on one or more stages of the cell cycle. Therefore, they are divided into two main groups according

to their mode of action or effect, i.e. cell cycle-specific drugs and cell cycle non-specific drugs.[2]

Cell cycle-specific drugs

Cell cycle-specific drugs exert their action on cells which are actively dividing, i.e. at any stage between phases G_1-M. Major classes of drugs which belong to the cell cycle specific group include:

- *Antimetabolites:* Folic acid, purine and/or the pyrimidine antagonists, e.g. methotrexate, mercaptopurine, cytarabine and fluorouracil
- *Antibiotics:* Bleomycin
- *Podophyllin alkaloids:* Etoposide and teniposide
- *Vinca alkyloids:* Vincristine, vinblastine and vindesine.

Cell cycle non-specific drugs

Cell cycle non-specific drugs act on cells irrespective of whether they are resting in the G 0 phase or actively dividing. Major classes of drugs which belong to the cell cycle non-specific group include:

- *Alkylating agents:* Busulphan, cyclophosphamide, melphalan and thiotepa
- *Nitrogen mustards:* Mustine (very toxic and seldom used), chlorambucil and melphalan
- *Nitrosureas:* Carmustine, lomustine, cisplatin, carboplatin and dacarbazine
- *Antibiotics:* Doxorubicin, dactinomycin, daunorubicin and mitomycin
- *Hormonal agents:* Androgen (testosterone propionate and drostanolone), oestrogen (ethinyl oestradiol) and progestin (medroxyprogesterone)
- *Anti-oestrogen:* Tamoxifen
- *Miscellaneous agents:* L-asparaginase, mitoxantrone and procarbazine
- *Antiviral agents:* Interferon.

General adverse effects of cytotoxic agents

Acute effects which occur shortly after administration include anorexia, nausea and vomiting (Figure 3), allergic reactions (skin rashes, itching and erythema) and local skin irritation and vesicant (blistering and ulceration).

Delayed effects occur days or weeks after administration and include:

- *General:* Stomatitis, mouth ulceration, oesophagitis, abdominal pain, diarrhoea, intestinal ulceration and perforation
- *Bone marrow depression:* Leukopenia, anaemia and thrombocytopenia
- *Peripheral neuritis:* Tenderness, numbness and tingling
- *Skin pigmentation:* Skin folds and area around the mouth may darken (bleomycin, doxorubicin, hydroxyurea, cyclophosphamide and procarbazine)
- *Skin erythema and/or peeling:* Doxorubicin, capecitabine, fluorouracil, cisplatins and docetaxel.

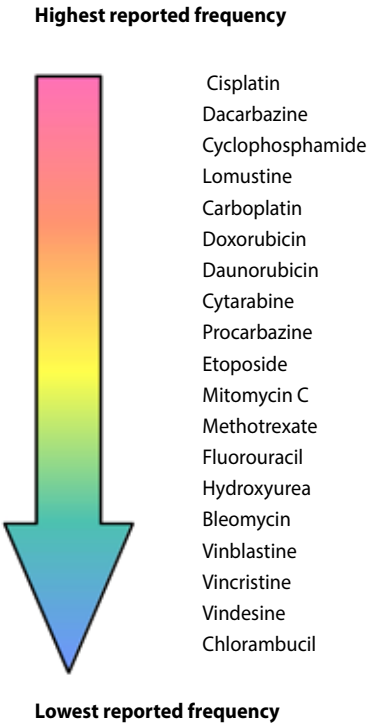

Figure 3: Cytotoxic drugs which cause nausea and vomiting[6]

Long-term effects may only become evident years after treatment, and include the suppression of ovarian or testicular function, as well as amenorrhoea, infertility, gynaecomastia and the development of secondary cancer. Other serious systemic long-term effects, and the cytotoxic agents most commonly implicated are described in more detail (Table I).

Resistance to cytotoxic drugs is a major problem in chemotherapy. Resistance may be primary, e.g. certain small cell lung and colon cancer, or acquired through repeated exposure. Acquired drug resistance may be specific to a single drug, or to several drugs from the same class.[1]

Additional precautions for cytotoxic chemotherapy

The immunosuppressant properties of cytotoxic chemotherapy agents increase the patient's susceptibility to infection, as well as his or her ability to cope with infection. Therefore, scrupulous hand hygiene and good infection prevention practices should be followed.[2]

A routine blood count, especially of the white blood cells, platelets and haemoglobin, should be carried out prior to treatment, and the treatment regimen stopped if the count

Table I: Summary of serious and/or life-threatening adverse effects of certain cytotoxic agents[2]

Adverse effect	Agent	Route	Uses
Extravasation at the IV site, resulting in ulceration and severe tissue necrosis, loss of function, or even amputation	Doxorubicin	IV	Cancers of breast, lung, thyroid, liver, ovary, testis, leukaemia and neuroblastoma
	Adriamycin		
	Vincristine	IV	Advanced breast cancer, non Hodgkin's lymphoma and relapsed non-lymphocytic leukaemia
	Mitoxantrone		
Irreversible hearing loss	Cisplatin	IV	Bladder, prostatic, head and neck tumours; and metastatic malignancies of ovary and testis
	Carboplatin		
	Mustine	IV	Hodgkin's and other lymphomas, and cancer of the lung
Renal failure and haemorrhagic cystitis	Cisplatin	IV	Bladder, prostatic, head and neck tumours; and metastatic malignancies of ovary and testis
	Vincristine	IV	Acute leukaemia, lymphoma, neuroblastoma, retinoblastoma, and aggressive brain, lung and breast tumours
	Cyclophosphamide	IV	*Note:* Mesna is used to reduce the risk of haemorrhagic cystitis associated with the use of cyclophosphamide and related agents
Acute pulmonitis, fibrosis and severe dyspnoea	Bleomycin	SC, IM and IV	Cervical cancer, oesophagus, head and neck, testis, bladder, lung and thyroid cancers
Neuromuscular and/or neurological (impaired walking, dizziness, confusion and convulsions)	Vincristine	IV	Acute leukaemia, lymphoma, neuroblastoma, retinoblastoma, and aggressive brain, lung and breast tumours
	Methotrexate	Oral IM, IV and IT	Leukaemia, lymphoma (except Hodgkin's) and osteosarcoma
Bone marrow suppression or failure (thrombocytopenia and leukopenia)	Vinblastine	IV	Hodgkin's lymphoma, chronic myeloid leukaemia, melanoma, neuroblastoma, inoperable breast, testicular and ovarian cancers, head and neck tumours
	Hydroxyurea	Oral	
	Fluorouracil	IV	Gastrointestinal tract and breast cancer
		Topical	Skin cancer
Jaundice and liver failure	Methotrexate	Oral, IM, IV and IT	Leukaemia, lymphoma (except Hodgkin's) and osteosarcoma
	Mercaptopurine	Oral	Childhood leukaemia
Acute haemorrhagic enteritis and intestinal perforation	Methotrexate	Oral, IM, IV and IT	Leukaemia, lymphoma (except Hodgkin's) and osteosarcoma
Anaphylactic reactions and cardiorespiratory collapse	Bleomycin	SC, IM and IV	Cervical cancer, oesophagus, head and neck, testis, bladder, lung and thyroid cancers
	Doxorubicin	IV	Cancers of breast, lung, thyroid, liver, ovary, testis, leukaemia and neuroblastoma
Teratogenic and foetal death	Methotrexate	Oral, IM, IV and IT	Leukaemia, lymphoma (except Hodgkin's) and osteosarcoma

CML: chronic myeloid leukaemia, IT: intrathecal, IV: intravenous, IM: intramuscular, SC: subcutaneous

indicates neutropenia or thrombocytopenia. These agents should not be given to patients with acute infections, and treatment should be interrupted or deferred if an infection develops.

The need for the use of contraception should be explained and encouraged in sexually active patients. The use of cytotoxic agents is not recommended in pregnancy, especially during the first trimester, nor in lactating mothers.

Local clinical precautions

Many agents are vesicant or irritant, and care must be taken to avoid contact with the skin or eyes. Extravasation of cytotoxic agents at the catheter insertion site is potentially very serious, causing severe pain and tissue necrosis. The clinical precautions to be taken are summarised in Table II.

Extravasation, i.e. the accidental infiltration of cytotoxic agents into the subcutaneous tissue surrounding the infusion site, must be treated as a clinical emergency.[2]

Signs of extravasation are as follows:[2]

- Any swelling or leakage of fluid at the infusion site
- Complaints from the patient of a sharp stinging or burning sensation near the infusion site
- Lack of venous return
- The infusion ceases to flow
- Any difficulty in pushing the syringe plunger while administering a bolus injection

Table II: The peripheral administration of intravenous cytotoxic chemotherapy

Do
• Ensure patient comfort for the duration of the treatment • Keep emergency drugs at hand • Maintain an aseptic technique • Check all blood counts prior to commencing treatment • Erect a new infusion for chemotherapy • Only use limbs with uncompromised circulation • Use a vein which is patent, easily visible, previously unused, as straight as possible, and which does not involve a joint • Choose a 23-G or 25-G butterfly for short infusions, and a small-gauge intravenous catheter for longer infusions • Seek assistance from a second person after three unsuccessful attempts at inserting an intravenous catheter • Ascertain patency of the line by flushing the catheter with at least 10 ml of sterile normal saline • Observe the infusion site and the greater part of the limb at all times • Flush the catheter intermittently with sterile normal saline, and before commencing a new drug or infusion • Infuse the drug over the prescribed period • Give known vesicant (irritant) drugs last when more than one drug is administered • Apply pressure for 3-4 minutes following removal of the catheter. Inspect the site for leakage. • Record all actions and any adverse reactions • Wear a disposable plastic apron (to prevent contamination of your uniform) and nitrile or polyvinyl chloride gloves
Don't
• Be interrupted during preparation and administration • Contaminate yourself with cytotoxic agents • Contaminate sterile equipment • Use pre-existing peripheral infusions • Use the arm on the mastectomy side, or where lymphoedema is evident

- Erythema around the infusion site
- Itching at the insertion site and/or along the course of the vein.

Extravasation should be managed as follows:[2]

- The infusion should be stopped immediately, leaving the intravenous catheter in situ
- Any solution in the needle and/or tissues should be withdrawn by pulling back with a syringe
- The area must be infused with 10-50 ml of sterile normal saline through the catheter to dilute the infiltrated drug
- The drug information sheet (package insert) must be checked for a specific antidote, if any
- The intravenous catheter should be removed from the vein
- An ice pack can be applied to the infiltration site, and the arm elevated to reduce blood flow to the area for at least 24 hours
- The patient's oncologist must be notified immediately
- The incident of extravasation and treatment given must be recorded in detail in the patient's records
- An incident report should be completed.

Workplace safety

Exposure to cytotoxic drugs may occur during all phases of preparation, administration and disposal, including during the disposal of patient urine and faeces.[2,7,8]

Routes of contact include direct skin contact, inhalation and the ingestion of aerosolised particles. Careless handling of these agents could cause nausea, vomiting, lightheadedness and a local toxic or allergic reaction. The long-term effects of continued low-level occupational exposure are still unknown.

Occupational health and safety aspects

A risk assessment should be undertaken to identify the hazards, e.g. which cytotoxic drugs are being handled, their potential adverse effects on health, and to decide if existing precautions are adequate or whether further action needs to be taken. Exposure from all routes should be prevented or adequately controlled.[2,7,8]

All personnel handling these agents must be specifically trained in their preparation and administration, and given sufficient information to ensure awareness of the risks of working with these agents and the precautions to be taken. Pregnant staff should not handle these drugs.

In terms of biological and health monitoring, it is recommended that employers keep a health record of all staff who may be potentially exposed to these compounds. The undertaking of an annual investigation (e.g. a full blood count) is controversial, and should only be considered in conjunction with the risk assessment, and if any untoward symptoms have been reported by personnel.

Reconstitution should be carried out in a designated area, preferably in a biological class II vertical laminar flow safety cabinet in the pharmacy, the efficacy of which is evaluated by an independent air quality contractor.

Protective clothing

In terms of the Occupational Health and Safety Act (No 85 of 1993), personal protective equipment should be provided and used whenever there are risks to health and safety which cannot be adequately controlled in other ways. Unit managers should ensure that employees are trained annually in the use of personal protective equipment, and records kept.[2,7,8]

Polyvinyl chloride or nitrile gloves are recommended, since some agents easily penetrate latex or polyethylene. Care must be taken not to perforate the gloves, which should be replaced if this occurs. Fluid-resistant disposable gowns, with a closed front, long sleeves and closed cuffs, protect against skin exposure in the event of accidental spillage. Surgical masks should be worn to prevent the inhalation of droplets or microscopic aerosolised particles. Eye protection is necessary if reconstitution is not carried out in a safety cabinet. Potentially contaminated clothing must not be worn outside the preparation area. If non-disposable gowns are used, these should be disposed of in a yellow plastic bag for laundering and sealed prior to removal. Hands must be washed and dried well after glove and personal protective equipment removal.

Drug preparation and/or reconstitution

Syringes and intravenous sets with Luer® lock fittings should be used, where possible.[2,7,8] To avoid aerosolisation when ampoules are broken, liquid or powder should be tapped down from the tip, and the neck of the ampoule wrapped in a dampened alcohol swab before breaking.

Positive pressure must be prevented from building up inside vials when their powdered contents are reconstituted as this can result in aerosolisation when the needle is removed from the vial. Also, small amounts of drug fluid may drip from the lumen of the needle. An added safety measure can be implemented by drawing extra air out of the vial before removing the needle.

When checking drug volumes and dosages, needles should always be capped, and a damp alcohol swab held around the hub while excess air in the syringe is expelled. This will catch any escaping droplets.

Special care must be taken when priming an intravenous administration set. The distal tip cover must be removed before priming. Priming should be performed onto a gauze swab in a secure receptacle, e.g. an intravenous tray.

Reconstituted drugs dispensed for administration should bear a cautionary label that warns that the contents are hazardous, and should be disposed of in the appropriate manner.

What to do in the event of acute exposure to a cytotoxic agent

In the event of accidental spillage of a cytotoxic agent, protective clothing must be worn by the personnel who clean up.[2,7,8] The spill should be blotted with absorbent paper, towelling or gauze, and disposed of in a green pharmaceutical waste container labelled with a designated cytotoxic waste sticker.

The area must be washed with water, then 70% alcohol, and the manufacturer's deactivation solution if indicated, e.g. sodium thiosulphate. In the event of skin contact, the affected area should be washed immediately with soap and rinsed using copious amounts of water. The eyes should be thoroughly irrigated with water or normal saline in the event of eye contact.

Bleeding should be encouraged in the event of a needle prick, and the area washed well with soap and water. The puncture wound must be covered with a waterproof dressing.

Report the incident to the health and safety coordinator as soon as possible, and complete an incident form.

Disposal of equipment and personal protective equipment used with, or contaminated by, a cytotoxic agent

Unused drug solutions, intravenous sets, vacolitres, needles, vials, ampoules, gloves, disposable gowns and any other items which have come into contact with cytotoxic drugs should be disposed of in a green (i.e. pharmaceutical waste) plastic waste bag, which has been placed inside a sealable, designated puncture-proof green pharmaceutical risk waste container.[2,7,8]

The "cytotoxic hazard" symbol on a sticker or label must be clearly visible on the container (Figure 4).

Cytotoxic waste should be segregated from other hospital waste. Records of collection and disposal by the healthcare risk waste contractor should be maintained in a healthcare risk waste register.

If non-disposable gowns have been used, these should be disposed of in a sealed, yellow plastic bag, labelled with the ward's particulars, for laundering.

Figure 4: Example of a hazard symbol to designate cytotoxic waste

Disposable plastic aprons should be worn when disposing of patient urine and faeces. Patient waste products should be flushed away with a copious amount of water.

Administration of cytotoxic chemotherapy via the central venous route

The decision to administer cytotoxic chemotherapy via the central venous route is made for a number of reasons, including:

- Poor peripheral venous access, which is very painful for the patient (especially children), and which increases the risk of extravasation and local complications
- Vesicant and irritant cytotoxic agents
- Prolonged and/or repeated treatment regimens.

A central line or catheter is defined as an infusion which terminates at, or close to, the heart; or in one of the "great vessels".[9]

Long-term catheters or implantable devices (Figures 5, 6 and 7) are inserted under strict aseptic conditions in an operating theatre by designated experienced surgeons. Catheters are inserted in a large vein and threaded into the central venous system. This route of administration ensures rapid dilution and dispersal of the cyto toxic agents.

The central venous catheter insertion sites most frequently used include the following:

- Aorta
- Pulmonary artery
- Superior or inferior vena cava (the preferred site for long-term catheters and implantable devices)
- Brachiocephalic veins
- Internal jugular veins
- Subclavian veins
- External iliac veins
- Common femoral veins
- Umbilical artery or vein (neonates).

Take note of the following for safe injection practices:[9]

- Follow appropriate infection control practices during the preparation and administration of injected medication
- Disinfect catheter hubs, needleless connectors and injection ports before accessing a vascular catheter
- Never administer medication from the same syringe to more than one patient, even if a new needle is used
- Once a syringe or needle has been used to enter or connect to a patient's intravenous catheter, it is contaminated, and should not be used on another patient, or inserted into a medication vial
- Never insert a used syringe or needle into a vial
- Never use medication packaged as a single-dose vial in more than one patient
- Assign medication packaged as a multi-dose vial to a single patient, whenever possible
- Do not use bags or bottles of intravenous solution as a shared source of supply in more than one patient.

Types of central venous catheters commonly used to administer cytotoxic chemotherapy

Tunnelled catheters

A tunnelled central venous catheter is usually the preferred practice (e.g. a Groshong® catheter, Figure 5) for long-term vascular access. A tunnelled portion of these catheters exits the skin (on the anterior chest wall, Figure 6), with a Dacron® cuff just inside the exit site. The cuff inhibits the migration of microorganisms along the catheter tract by stimulating growth of the surrounding tissue, sealing the catheter tract and providing a natural anchor for the catheter.

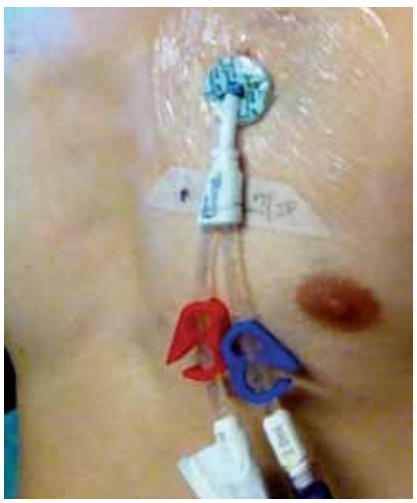

Figure 5: Image showing where a tunnelled catheter (with two lumens) is inserted into the anterior chest wall[10]

Figure 6: Image of a totally implantable device for central venous vascular access, with needle assembly inserted[11]

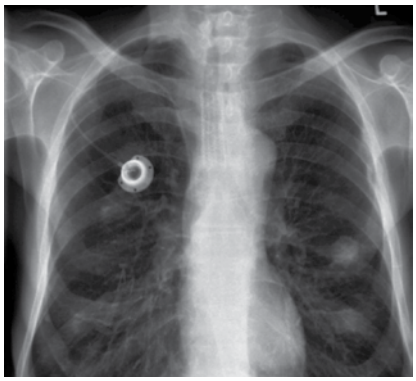

Figure 7: X-ray showing an implanted port[12]

Totally implantable intravascular devices

Totally implantable intravascular devices are also tunnelled beneath the skin, but feature a subcutaneous port or reservoir with a self-sealing septum which is accessed by needle puncture through intact skin. The advantages of this device are a lower reported rate of catheter-related bloodstream infections (CRBSIs) owing to the absence of an insertion site (once healed), and an improved patient self-image.

The prevention of central line-associated bloodstream infections

The threat of a central line-associated bloodstream infection (CLABSI) is extremely high, given the immunocompromised state of patients. The complications associated with the insertion and maintenance of these devices are a major cause of morbidity and mortality. Seventy per cent of healthcare-acquired bloodstream infections are catheter related, and at least one in five patients die from a CLABSI.[9,13,14]

Advances designed to provide additional protection against catheter-related infection have also been made in intravenous catheter technology, e.g. antiseptic-impregnated catheter material, silver-impregnated collagen cuffs and antibiotic-coated catheters. The action of these products aims to prevent the migration of skin and contaminating microorganisms down the catheter track.

The reader is referred to the Centers for Disease Control and Prevention, United Kingdom National Health Service Hospitals' Evidence-Based Guidelines and National Institute for Health and Care Excellence standards for best practice. These should be considered as non-negotiable for healthcare professionals involved with the insertion and maintenance of patients' central lines.[9,13,15]

Briefly, these include:

- Adhering to scrupulous hand washing and hand hygiene
- Ensuring thorough site preparation
- Ensuring catheter stabilisation
- Applying occlusive dressings in the days following insertion
- Carrying out ongoing site inspection
- Accessing the catheter or device only when necessary
- Taking cognisance of admixture and administration set precautions
- Implementing operator expertise.

Documented protocols, training and clinical assessment at regular intervals, and detailed quality assurance measures, such as tracking "line days" and CLABSI rates, must also be in place.

The Best Care…Always! campaign

Based upon highly successful and innovative international programmes, such as The Institute for Healthcare Improvement's 100,000 Lives Campaign, the the Canadian Patient Safety Institute's Safer Healthcare Now! programme, and the World Health Organization's World Alliance for Patient Safety programme, the Best Care… Always! campaign, a South African initiative, has been designed to support the efforts of hospitals to reduce patient morbidity and mortality caused by hospital-acquired infections by sharing best practices around the implementation and measurement of simple, quality improvement practices known as "bundles".

Essentially, a bundle is a grouping of usually not more than five items of "best practices" to be implemented for a disease process, and which individually improve care, but when applied together result in a substantially greater improvement. In other words, the evidence-based science behind the bundle has become so well established that it is considered to be the standard of care. Importantly, once a clinical bundle has been implemented, compliance with the bundle components must be measured and documented, to ensure consistency. An "all or none" approach should be used, e.g. in which a "Yes"/"No" checklist is employed, and continual feedback given to the staff accordingly.[14]

A CLABSI bundle involves:[14]

- High-level hand hygiene
- Maximal sterile barrier precautions, i.e. the doctor who is inserting the catheter is required to wear a non-sterile cap (all hair should be under the cap), a face mask covering the nose and mouth tightly, a sterile gown and gloves, and the patient's head and body must be covered with a large sterile drape
- Skin disinfection and catheter care with 0.5% chlorhexidine in 70% isopropyl alcohol
- Optimal catheter site selection. (The subclavian vein is the preferred site for central catheters in adults)
- A daily review of line necessity and the prompt removal of unnecessary lines.

The standard for vascular catheter securement, dressings and catheter site care

0.5% chlorhexidine gluconate in 70% isopropyl alcohol (or povidone iodine in alcohol for patients with sensitivity to chlorhexidine) should be used to vigorously clean the catheter insertion site and skin over an implanted device. The catheter insertion site and skin should be allowed to air dry for approximately two minutes.[9,13,15]

Sutureless securement devices lower the risk of CLABSIs. A sterile, transparent, semi-permeable polyurethane dressing can be used to cover a new intravascular insertion site. The dressing must be changed every 4-7 days, or sooner if it has

become loose, or if moisture has accumulated under the dressing.

A sterile gauze dressing should be used if the patient is perspiring profusely, or if the insertion site is bleeding or leaking. The dressing can be changed when inspection of the insertion site is necessary, or if the dressing becomes damp, loose or soiled. If compromised, it should be replaced with a transparent semi-permeable dressing as soon as possible thereafter.

A dressing used on tunnelled or implanted catheter insertion sites should be replaced every seven days until the insertion site has healed, unless there is an indication to change it sooner. A dressing is no longer required once the insertion site has healed. However, securement of the catheter with an appropriate device (not adhesive tape) is necessary to prevent dragging on the catheter.

The selective use of chlorhexidine-impregnated dressings should be considered in high-risk (e.g. neutropenic) adult patients as a strategy to reduce CRBSIs. The use of antimicrobial central venous catheters should be considered in high-risk patients where catheter duration is prolonged, or if CLABSI rates remain high.

Improved outcomes have also been demonstrated with daily patient full body cleansing with a chlorhexidine gluconate-based liquid soap.

Poor and controversial practices include:

- Local hair removal by shaving, rather than clippers
- Antimicrobial prophylaxis after catheter insertion or during use to prevent colonisation
- The use of topical antimicrobial ointments at the insertion site. (Femoral haemodialysis catheters are the exception)
- The routine use of heparin, disinfectant, antibiotic or ethanol "locks"; arterial or venous cutdown for central venous catheter insertion; and in-line intravenous filters.

Conclusion

Providing a safe environment and competent, compassionate care is a singular responsibility, and accompanying vulnerable patients through a gruelling and often lengthy treatment regimen is both a privilege and immeasurably rewarding.

Oncological nursing is one of the fastest developing specialities. It is hoped that this article has highlighted areas in which clinical intervention may be required, as well as opportunities for staff development using the expertise of professionals in the field.

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