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An Implantable Venous Access System for Cancer Patients

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ABSTRACT : Sustained venous access is assuming increasing importance in clinical medical practice for the infusion of antibiotics, cytotoxic drugs, blood products and parenteral nutrition. The limitation of peripheral venous access in patients receiving cancer chemotherapy can be a major problem. Many antineoplastic drugs are vesicant and may cause skin ulcers when they are extravasated into the tissue. Recent technological advances in development of non-thrombogenic silastic catheters have facilitated in-dwelling catheters to be implanted for long periods. Port-A-Cath (R) is a totally implantable vascular access system which allows for blood to be sampled and also infusion of drugs and blood products.

Between March 1985 to Oct 1987, 20 Port-a-Cath (R) implanted on 19 patients (14 males and 5 females). Criteria were drawn up to select these patients for this vascular access system. The quality of life was significantly improved for these patients who receive long term chemotherapy or blood products through this device. There were 6 episodes of transitory occlusion of catheter and 1 episode of infection. Continuous infusion of drugs given through this device does not produce chemical phlebitis. It has also facilitated new methods of delivering cytotoxic drugs and analgesia.

KEY WORDS : Implantable central venous access system, cancer chemotherapy, continuous infusion chemotherapy.

INTRODUCTION

The role of cancer chemotherapy is well established in cancer management. Many of the cytotoxic drugs are vesicant and may cause chemical phlebitis, thrombosis and sclerosis. Classes of drugs, such as the anthracyclines, vinca alkaloids, Mitomycin-C, DTIC and M-A-MSA cause severe skin ulceration and necrosis when the drug is extravasated during admini-

stration. Many patients with haematologic malignancies and solid tumours require frequent and sometimes prolonged infusion of cytotoxic drugs. Vascular access is a physical and psychological problem for patients on chemotherapy. Many patients remember the number of painful venipunctures which they endured. Those patients who had extravasation of drugs developed painful cellulitis or ulcers which were difficult to heal. They often required debridement and skin grafting. With

the development of non thrombogenic indwelling Hickman or Broviac catheters, this problem has been partially solved^{1) 2) 3)}. However a patient with Hickman catheter requires considerable care because the catheter is externalised and requires frequent flushing²⁾. About 5 years ago, Pharmacia International developed a totally implantable central venous access device which serves as an access system for infusion of antibiotics, antineoplastic agents, blood products and parenteral nutrition.^{4) 5)}

A study was made to evaluate the indications for implantation of this central venous access called Port-a-Cath^R). The system consists of a stainless steel injection reservoir with a silicone rubber septum (Fig 1). The reservoir is connected to a silastic catheter by a slip ring. This study was designed to evaluate its usefulness for administration of cytotoxic drugs and the patients' acceptance of this device. The complications and side effects of this device was closely monitored.

TOTALLY IMPLANTABLE CENTRAL VENOUS ACCESS

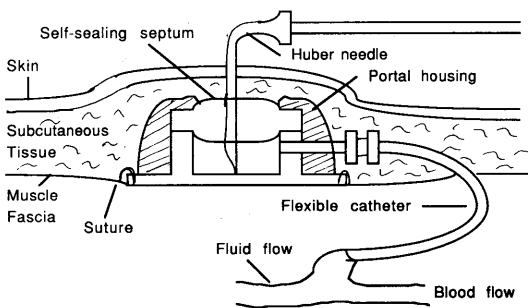


Fig. 1. Totally implantable central venous access

MATERIALS AND METHOD

Patients Selection

The following criteria were drawn up for patients' eligibility for the study :

- a) estimated life expectancy must be more than 3 months
- b) patients' chemotherapy programme must be more than 6 months or requires intensive administration of drugs/blood products

- c) there must be a problem in accessing peripheral veins
- d) there must be no significant coagulation defect at time of surgical implantation

Surgical Implantation Technique

The implantation is done under general anaesthesia. The catheter is first inserted into the internal jugular vein from an incision above the clavicle. When the tip catheter is located above the superior vena cava, the other end of the catheter is tunnelled to the anterior chest where the port is implanted just above the nipple.

Maintenance of Port-a-Cath

The Port-a-Cath was almost immediately used for administration of drugs after implantation. Withdrawal of blood samples could be taken through the Port-a-Cath besides being used for administration of cytotoxic drugs, blood products, antibiotics and parenteral nutrition. Special Huber needles have to be used to access the port. The catheter must be flushed with heparinised saline every 4 weeks when it is not in use.

Results

Between March 1985 to October 1987, 19 patients have been entered into this study (Table 1). There were 20 devices implanted on 14 males and 5 females with median age of 33 years and range 12-58. The mean duration of Port-a-Cath implantation is 4 months with range 1-17 months. There were 6 patients with Non Hodgkin's lymphoma, 3 with nasopharyngeal cancer and acute leukaemia, 2 each for Hodgkin's disease, ovarian cancer, 1 each with cervical cancer, testicular cancer and idiopathic myelofibrosis. 4 patients had ambulatory infusion pumps for continuous cytotoxic drugs delivered through Port-a-Cath.

Advantages

The device is an easy access system for blood sampling, infusion of fluids, antibiotics, cytotoxic drugs and blood products. It is cosmetically superior to Hickman catheter because it is totally implantable. The patients do not complain about the discomfort and

Table 1. Patient Characteristics

No. of Port-a-Cath implanted	20
No. of patients	19
Patient age (mean)	33
(range)	12-58
Male/Female	14/5
Diagnosis :	
Non Hodgkin's Lymphoma	6
Acute Leukaemia	3
Nasopharyngeal cancer	3
Hodgkin's disease	2
Ovarian cancer	2
Tasticular cancer	1
Cervical cancer	1
Idiopathic myelofibrosis	1
Duration of Port-a-Cath implantation (months)	1-17
Complications :	
Occlusion	6
Wound haematoma	3
Infection	1

many could resume their previous lifestyle such as swimming, bathing, jogging and basketball. The patients and medical staff experience less anxiety when doing a venipuncture and some have received continuous infusion of cytotoxic drugs delivered by ambulatory infusion pumps via the Port-a-Cath.

Disadvantages

The device is relatively expensive and patients are anxious when they are told that it could be left permanently. The medical and nursing staff must be trained to access the device and the catheter must be flushed at least every 4 weeks. Several complications were initially encountered but with experience, there were less complications. The most common complication was occlusion of catheters which was reversed by flushing with heparinised saline and occasionally with thrombolytic agents. Localised haematoma at site of implantation of port or wound infection were occasionally encountered. There was one episode of septicaemia which could be attributed to the implantation of the device. Fortunately it was controlled with systemic antibiotics.

DISCUSSION

With the technological advances of silastic catheters and vascular access systems such as the Port-a-Cath, this development has made administration of cytotoxic drugs less hazardous and more comfortable. In this early experience, very few complications were encountered and they were reversible. All the patients have unanimously stated that there is less anxiety associated with cytotoxic drug administration and better quality of life with Port-a-Cath. Patient acceptance was universal ; the good cosmetic appearance and the minimal care required were particularly pleasing. The major advantage this device has over Hickman catheter is that it uses the skin as the natural barrier and this has enabled all the patients to resume their previous lifestyle such as swimming and bathing. This improved quality of life is very important for patients on chemotherapy.

With the introduction of Port-a-Cath, it has eliminated the problem of drug extravasation in these patients with difficult peripheral veins. Physicians and nurses found the system easy to use for both bolus injections and repeated continuous infusions. The only disadvantage is the need for monthly flushing with heparinised saline. Our group is looking into extending the use of Port-a-Cath for intraarterial and intraperitoneal administration of cytotoxic drugs.

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