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Long-term venous access using a subcutaneous implantable drug delivery system

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Summary

To facilitate long-term venous access in patients receiving chemotherapy, a subcutaneous totally implantable system (Port-a-Cath, Phamacia) has been used in 14 patients. The method of implantation and the advantages over conventional central venous catheters are discussed. The expense of the system necessitates careful patient selection.

Introduction

Venous access is a problem in patients receiving long-term cytotoxic therapy. Because of the irritant nature of the drugs, thrombophlebitis is very common when peripheral veins are used. The use of the Hickman and other central venous catheters has been advocated in an attempt to overcome this problem *(1,2)*. We have recently used in a selected group of patients a subcutaneous implanatable system—the Port-a-Cath (Pharmacia).

The System

The Port-a-Cath system consists of:

1. A stainless steel portal or reservoir with a silicone self-sealing septum (Fig. 1).
2. A silicone catheter which is connected to the portal with a slip ring. The external catheter diameter is 2.8 mm and the internal diameter is 1.0 mm.
3. Straight and 90° Huber-point needles. The bevels are constructed to slice through the silicone septum without coring it.

INDICATIONS

All our patients selected for implantation of this system required long-term chemotherapy where venous access was needed for longer than 3 months (Table 1). This system has also been advocated by others for use in patients requiring long-term parenteral nutrition *(2)* and for regional chemotherapy to liver metastases by placement of the catheter in the portal vein *(3)*.

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TECHNIQUE

In most cases general anaesthesia is preferred although implantation can be performed under local anaesthesia. Under full aseptic conditions the anterior chest wall and lower half of the neck are prepared. A short vertical incision is made over the delto-pectoral groove and deepened to expose the cephalic vein. The vein is isolated over a short distance and ligated distally. The length of catheter to reach the superior vena cava or right atrium is estimated, the catheter is introduced via the cephalic vein and the position checked radiographically. Occasionally cannulation of the cephalic vein is not possible. In these situations another incision is made over the lower part of the posterior triangle of the neck to expose the external jugular vein. Cannulation of this vein is usually easy; however the catheter can occasionally run down the subclavian vein towards the arm instead of into the superior vena cava.

An oblique incision is then made over the anterior chest wall away from the breast. A subcutaneous pouch is created medial to the incision, as in a proportion of patients there is a resultant area of anaesthesia which makes subsequent access to the portal even less painful for the patient. A small Redivac introducer is used to tunnel the catheter from the first incision to the second incision (Fig. 2). The portal is then filled with heparinised saline and connected to the catheter. The portal is anchored to the fascia with 3-O nylon sutures and the incisions closed. If infusion is required immediately, a 90° needle is used to penetrate the skin and septum, before the development of local swelling makes it difficult to palpate the portal.

SUBSEQUENT MANAGEMENT OF THE SYSTEM

The portal needs to be flushed with heparinised saline once a month. We use it primarily for infusions of drugs and blood, using a peripheral vein for venous sampling. To gain access to the portal, the flat septum is palpated through the skin and the needle introduced through it on to the base of the portal. The syringe is then aspirated to ensure that the catheter is patent.

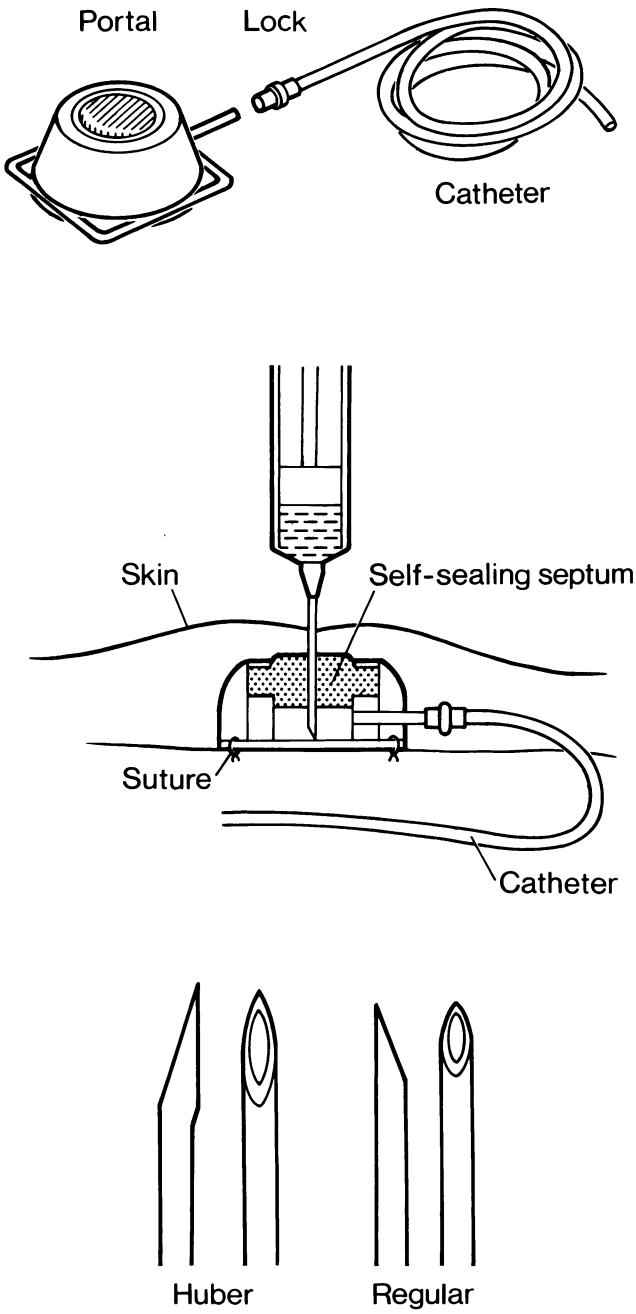

FIG. 1 The Port-a-Cath system and diagram to show percutaneous access to the portal using the Huber-point needle.

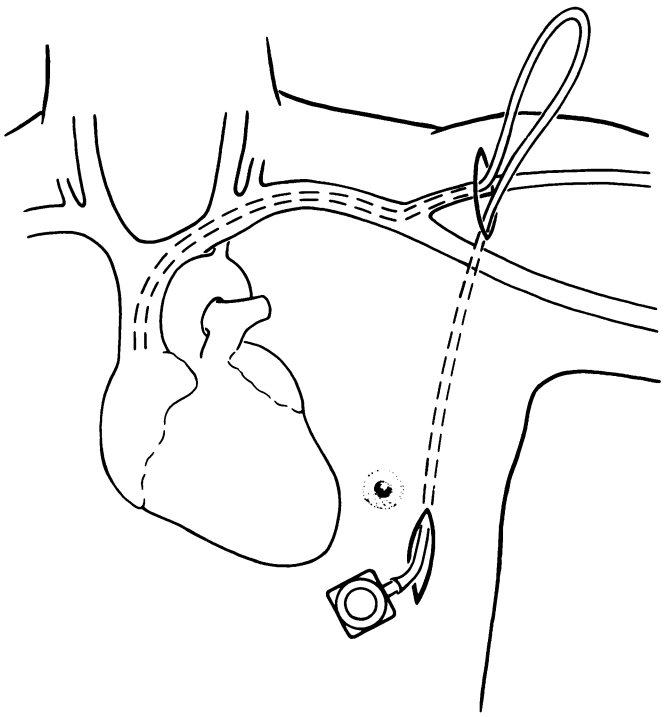

FIG. 2 Following placement via the cephalic vein, the catheter is tunnelled through to the lower incision.

TABLE I *Diagnosis and chemotherapy in 14 patients using the Port-a-Cath system*

Disease	*Cytotoxic Agents*
Malignant schwannoma	Adriamycin,® ifosfamide
Ewing's sarcoma	Ifosfamide
Sarcoma, uncertain histogenesis	Ifosfamide, Adriamycin®
Ovarian carcinoma	Bleomycin, VP16
Sarcoma, uncertain histogenesis	Adriamycin,® ifosfamide
Lymphoma	Cytosine arabinoside, cyclophosphamide, Methotrexate
Rhabdomyosarcoma	Adriamycin®
Lymphoma	Adriamycin® Bleomycin Vincristine
Ovarian carcinoma	JM8
Ovarian carcinoma	JM8; bone marrow reinfusion
Ovarian carcinoma	JM8; bone marrow reinfusion
Ewing's sarcoma	Vincristine Actinomycin-D Cyclophosphamide
Ovarian carcinoma	VP16, bleomycin
Ovarian carcinoma	Cyclophosphamide

Results

We have implanted the system in a total of 14 patients, 12 of whom are still alive (Table 1). In one patient the system has been in place for 10 months and is still working well. We had complications in 2 patients, early in our experience. In our first, the needle was misplaced during cytotoxic infusion in the first postoperative week and Adriamycin® leaked into the subcutaneous pouch. This resulted in wound dehiscence and the portal was removed for fear of it providing a focus of sepsis. In the second patient the system worked well but the patient complained of recurrent pains in the shoulder and upper limb. There was no evidence of venous thrombosis or other local complications but the catheter and portal were removed anyway; the pain did not improve after removal of the system. To date we have had no cases of infection, thromboembolism or catheter blockage following implantation.

Discussion

The system is expensive. The catheter and portal cost about £240. To justify its cost the selection of patients is important. For patients requiring short-term parenteral nutrition or only 1 or 2 courses of chemotherapy, the less expensive Hickman catheter is our choice.

The Port-a-Cath system has advantages over the Hickman catheter, however. Dressings are not required and the risk of infection is greatly reduced as there is no exit site *(4,5)*. The system needs to be flushed only monthly unlike the Hickman catheter which requires flushing every 48 hours *(1)*. Because of the reservoir of heparinised saline in the Port-a-Cath system, catheter occlusion is not a problem. Gyves *et al. (5)* recorded catheter occlusion in small-bore (0.38 mm lumen)

catheters but this was not encountered with larger-bore (0.63 mm lumen) catheters, as is our experience.

Palpation of the portal is usually not difficult, though a thick subcutaneous layer makes it more so. Nurses in our intravenous team have had no further problems since the early episode of Adriamycin® extravasation. Patient acceptance is good, and they are pleased at the minimal care requirements and lack of restriction of their activities when this system is used.

We wish to thank the Department of Medical Illustration at the Royal Marsden Hospital for preparation of the line drawings.

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Notes on books

Critical Care Nursing by C V Kenner, C E Guzzetta and B M Dossey. 954 pages, illustrated. Little, Brown, Boston. $31.50.

A comprehensive book for nurses in the intensive care unit emphasising the need for a holistic approach. Detailed and heavily referenced.

Manual of Clinical Problems in Surgery by Bruce S Cutler, Thomas F Dodson, Wayne E Silva and Thomas J Vander Salm. 484 pages. Little, Brown, Boston. $19.95.

This manual, which is spiral-bound, presents concise summaries of selected topics in general, vascular and thoracic surgery. Both common problems and controversial problems are covered. Each topic is extensively annotated by key references including comprehensive review articles. These are not confined to American literature and are fully up to date.

Renovascular Hypertension by J C Stanley, C B Ernst and W J Fry. 384 pages, illustrated. Saunders, London. £49.50.

There have been a number of advances in this field recently with newer anti-hypertensive drugs and percutaneous transluminal angioplasty. The first part of this book introduces the subject and the physiological background. The second part deals with diagnostic aspects and the major part deals with treatment.

Surgical Nutrition edited by Josef E Fischer. 811 pages, illustrated. Little, Brown, Boston. $71.50.

Forty-six authors contribute to this comprehensive volume on all aspects of parenteral and enteral nutrition. Extensively referenced (383 for chapter 2 alone) this volume will enahance the shelves of all surgeons interested in nutrition.