Reuse of flow-directed balloon-tipped catheters

Right heart catheterisation using a flow-directed, balloon-tipped catheter has become almost standard practice in the management of patients with acute cardiovascular and respiratory failure and is one of the reasons for the high cost of treating the critically ill. While some balloon catheters are designed for single use only, the Edwards Laboratories balloon flotation catheters may be resterilised with ethylene oxide and reused, thereby reducing costs.

Compared with new catheters resterilised catheters are less rigid and have an increased incidence of balloon rupture. Without the balloon tip the catheter cannot be floated easily into the pulmonary artery and pulmonary arterial occlusion pressures cannot be measured. To determine the optimum number of times these catheters could be sterilised and reused before the balloon ruptured we resterilised with ethylene oxide 50 consecutive flow-directed balloon tipped catheters and used them until the balloon finally ruptured.

Methods and results

Right heart catheterisations were performed with balloon-tipped thermodynamic catheters (Edwards Laboratories 93-131-7F) in all acutely ill patients in whom close haemodynamic monitoring was deemed necessary. Catheters (Desilet 7 French gauge Vygon) were inserted percutaneously by way of the right internal jugular or left subclavian vein. Catheter balloons were inflated with air up to but not exceeding 1.5 ml using a 2 ml syringe. The balloon was inflated before the catheter was used to test the patency of the balloon, during insertion of the catheter, and with each estimation of pulmonary arterial occlusion pressure. With each estimation of pressure the balloon was inflated to the minimum required to obtain a "wedge" trace and left inflated for five to 10 seconds before being deflated. After each use the catheters were washed and the lumens flushed with cold tap water. Standard ethylene oxide sterilisation was used.¹ The catheters were available for reuse after three days of aeration. Balloon rupture was assessed by sudden loss of resistance and inability to withdraw the injected air.

Fifty balloon flotation catheters were used a total of 206 times. Four balloons ruptured during the first use, with one balloon rupturing before insertion. Five more ruptured with the second use, and 11 with the third. All balloons ruptured after insertion into the patient. The incidence of rupture with the first, second, and third use of the catheter was 8%, 10.9%, and 26.8% respectively. After the fourth use 62% of the catheters had ruptured balloons. One catheter was used nine times (figure). Each catheter

Use of catheters before rupture of balloon.

was used $4.12 \pm \text{SD } 1.9$ times, and total use was 168 ± 110 hours. Each balloon was inflated and deflated 103 ± 15 times.

There was no clinical evidence of air embolism in any patient after the balloon had ruptured. We found no evidence to suggest an increased risk of thrombosis with the resterilised catheters.

Comment

In the laboratory fluoroscopy enables the operator to position the catheter correctly without the aid of a balloon tip. The catheter is often resterilised for further use. At the bedside, however, right heart catheterisation can be performed successfully only when the catheter

has a balloon tip. Often the catheter is discarded after one use because of the increased likelihood of rupture of the balloon with resterilisation. Our data show that the greatest incidence of balloon rupture occurs during the third use of the catheter (26.8%), the incidences with first (8%) and second (10.9%) use being similar. The total number of balloon inflations per catheter was 103 ± 15 , well below the average 250 inflation and deflation cycles that the balloon is normally able to tolerate (Edwards Laboratory product information), indicating that cleaning and resterilisation may have accounted for the reduced life span of the balloon.

We suggest that the balloon-tipped thermodynamic catheter may be resterilised for one extra use; thereafter the increased incidence of rupture of the balloon makes resterilisation and reuse unsatisfactory and potentially hazardous.

¹ Perkins JJ. Sterilisation of medical and surgical supplies with ethylene oxide. In: Perkins JJ, ed. *Principles and methods of sterilisation in health sciences*. Springfield, Illinois: C C Thomas 1969:154-69.

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Factors associated with age at diagnosis of breast cancer

A striking association between early onset of breast cancer and male pregnancies was recently reported from Sweden.¹ The data showed that of 150 women consecutively diagnosed as having breast cancer, 28 who had borne only sons were diagnosed at an average age of 49.9 and 33 who had borne only daughters at 61.0. Canadian workers failed to find such an association.² We carried out the present investigation primarily to find out whether there was such an association in a sample of American women.

Patients, methods, and results

Our sample comprised 386 women who were referred consecutively to a single surgeon (RWP) and had been newly diagnosed between 1 January 1976 and 1 January 1981 as having breast cancer. A total of 347 (90%) resided in Georgia, half in metropolitan Atlanta; 19 (5%) were black, most were American born, and their ages ranged from 21 to 89 years (mean $54.31 \pm \text{SD } 13.51$). In all but four of these women cancer had been histologically confirmed. Three hundred and forty women (88%) had cancers of pathological stage I or II; patients with clearly metastatic cancer had in general been referred to medical oncologists. The statistics used were the Pearson product-moment correlation coefficient r and its associated probability p .

The sex of the children had little direct association with age at diagnosis in these women (table). The sex of the last child, however, was related to age at diagnosis in the older women. Of the 139 parous women aged over 55 about half (68) had had boys as their last child and were about three years older than the others at diagnosis (67.19 ± 7.67 v 64.03 ± 6.79), a significant difference ($r = 0.22$; $p = 0.011$). (Their last deliveries had been at the average ages of 31.4 and 31.1 years, respectively.) No such association occurred in the younger women ($r = -0.06$) or in the entire group of 309 parous women ($r = 0.02$; $p = 0.7$).

Comment

Certain factors were associated with a significantly older age at diagnosis. Most are probably related to aging: whether or not the patient was breast fed (those who had been breast fed were older at diagnosis); age at menarche³ (the older then, the older at diagnosis);

Composition of sibships and mean ($\pm \text{SD}$) age at diagnosis of breast cancer

No of girls	No of boys		
	0	1	≥ 2
0	54.40 ± 16.67 (n = 77)	54.93 ± 15.34 (n = 36)	52.45 ± 13.04 (n = 40)
1	54.93 ± 12.51 (n = 28)	52.25 ± 12.26 (n = 65)	53.84 ± 11.17 (n = 37)
≥ 2	55.68 ± 10.75 (n = 32)	53.74 ± 13.99 (n = 41)	59.57 ± 10.45 (n = 30)

age at successive deliveries and at last delivery (positively correlated); height and stature (weight:height) at biopsy (younger women were taller and slimmer); and concentrations of oestrogen and progesterone receptors in the tumour.⁴ Possibly less direct indicators of age were also positively related: the number of children, how long she had nursed them, whether she had a sister with breast cancer, and the time between discovery of disease and biopsy.

To separate analytically the effects of aging from other causes that alter the age at diagnosis of breast cancer, data are needed on age-matched women of similar origins who do not have cancer.

We thank Dr Robert L Egan for access to his data files, which permitted independent verification of parts of our data.

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² Elwood M, Coldman A. Age of mothers with breast cancer and sex of their children. *Br Med J* 1981;282:734.

³ Korenman SG. The endocrinology of breast cancer. *Cancer* 1980;46:874-8.

⁴ Kiang DT, Kennedy BJ. Factors affecting estrogen receptors in breast cancer. *Cancer* 1977;40:1571-6.

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"Non-accidental injury" and wild parsnips

Phototoxic dermatitis may be caused by many plants (phytophotodermatitis), especially those of the genus *Umbelliferae*.¹ The linear and often bullous skin lesions may have a bizarre appearance. We describe a patient who presented in unusual circumstances.

Case report

In August 1980 an 8-year-old girl was visited by a social worker in connection with a forthcoming holiday. Her family was well known to the social services department owing to previous child neglect. The girl was noted to have extensive linear and blistering skin lesions, which the social worker thought might have been inflicted by the father with a whip or a lighted cigarette. The child and her parents were referred to hospital the same day. The parents stated that skin lesions had been present for 10 days, and the father repeatedly and indignantly protested that he had not touched her. The child denied any ill treatment.

The lesions were most prominent on the trunk, especially the back and shoulders (figure), but were also present on the forehead, hands, arms, thighs, and lower legs. Many lesions were linear with dusky redness consistent with whip marks, but closer inspection showed areas of brown hyperpigmentation. The lesions were recognised as those of phytophotodermatitis. It transpired that during recent sunny weather she had been playing on waste ground near her home wearing only her underpants. In view of the medicolegal aspects of the case a photographer subsequently visited the area with the child and photographed large quantities of wild parsnip (*Pastanaca sativa*), which was in full flower and starting to set seed.

Comment

Wild parsnip is a common yellow-flowered umbelliferous plant growing to a height of about one metre. It contains at least three furocoumarins (psoralens)—namely, 5-methoxypsoralen, 8-methoxypsoralen, and 5-isopentenylloxypsoralen¹—which act as photosensitisers. Development of lesions depends on exposure of the skin both to furocoumarins in the plant sap and to adequate amounts of long-wave ultraviolet irradiation.² The reaction is a phototoxic one and is not dependent on previous allergic sensitisation.³ The severity of skin lesions ranges from erythema through oedema to blistering in severe cases.^{2,4} Hyperpigmentation develops within a few days and is diagnostically helpful.⁴

Extensive skin lesions caused by phytophotodermatitis.

Furocoumarins are usually most abundant in mature plants that have flowered and set seed,¹ as in this instance. The usual time of presentation is in July and August, when the plants are fully developed, the weather is sunny, and children on holiday from school are playing out of doors, often wearing few clothes. The linear pattern of skin lesions corresponds to the areas of streaking of plant sap on to the skin from crushed or cut stems and leaves. The circumstances in which phytophotodermatitis was confused with non-accidental injury in this child were understandable. The prompt recognition of the true diagnosis enabled a potentially awkward and unpleasant situation to be rapidly defused.

We thank the audiovisual centre of Newcastle University for photographing the patient.

¹ Pathak MA, Daniels F, Fitzpatrick TB. The presently known distribution of furocoumarins (psoralens) in plants. *J Invest Dermatol* 1962;39:225-39.

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³ Epstein JH. Phototoxicity and photoallergy: clinical syndromes. In: Fitzpatrick TB, Pathak MA, Harber LC, Seiji M, Kukita A, eds. *Sunlight and man*. Tokyo: University of Tokyo, 1974:459-77.

⁴ Sommer RG, Jillson OF. Phytophotodermatitis (solar dermatitis from plants). Gas plant and wild parsnip. *N Engl J Med* 1967;276:1484-6.

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Correction

One year's treatment with propranolol after myocardial infarction; preliminary report of Norwegian multicentre trial

In the paper by Dr V Hansteen and others (16 January 1982, pp 155-160) the list of authors should contain the name of H P Dørum, MD, of the Central Hospital of Opland (Lillehammer).