

# The Effect of a Pressure Garment on Post-surgical Drainage and Seroma Formation in Breast Cancer Patients

C Y Y Chen, A L Hoe, C Y Wong

## ABSTRACT

**Background:** The treatment of choice for cancer of the breast are mastectomy and axillary clearance or wide excision with axillary clearance. The most common complication following such a procedure is seroma formation. Various methods have been used to prevent it. However, the use of a pressure garment in this context has not been fully evaluated in the current literature.

**Results:** In a randomised trial comparing patients with a pressure garment with those without one, we have found no improvement in post-operative drainage with the use of a pressure garment. There were more complications in the group without the pressure garment (19%) compared with those with the garment (15.7%). The only seroma occurred in those patients not using the garment. The use of the pressure garment appeared to increase the duration of use of the drain (6.8 vs 6.1 days), these differences in the two groups was not significant. One of the patients in the pressure garment group was unable to tolerate the warmth and discontinued wearing the garment in the third post-operative day. This gave a rejection rate of 5%.

**Conclusion:** The use of a pressure garment does not reduce the post-operative drainage, however, the complication rate appears to be higher when the pressure garment is not being used.

**Keywords:** post-operative drainage, seroma, pressure garment

## INTRODUCTION

Cancer of the breast is the most common form of malignancy in women<sup>(1)</sup> and surgery is the mainstay of treatment. Mastectomy and axillary clearance have been the surgical treatment of choice with adjuvant chemotherapy, radiotherapy and hormonal therapy, depending on the tumour characteristics and lymph node status. Recently, wide excision and axillary clearance with post-operative radiotherapy have been undertaken in selected patients with the intention of breast conservation. This came about after the finding by Fisher, that being more radical does not necessarily improve the survival of the patients. Despite the change in the methods of dealing with the primary

breast tumour, an axillary clearance is warranted for both therapeutic and prognostic purposes<sup>(2)</sup>. However, the clearance of the axillary nodes has been postulated to leave severed lymphatic ducts that leak lymph, predisposing to seroma formation. Seroma has been noted to be the most common complication following axillary clearance<sup>(3)</sup>. Seroma is defined as any fluid collection under the skin flaps after a mastectomy or in the axillary dead space after axillary clearance<sup>(4)</sup>. The nature of seroma formation is still unclear. Various factors have been thought to affect seroma formation. Restriction of shoulder movement after surgery has been shown to decrease post-operative drainage<sup>(5-7)</sup>, but this does not significantly decrease seroma formation<sup>(7)</sup>. Adjuvant treatment such as the use of tamoxifen post-operatively has also been shown to affect post-operative seroma formation<sup>(7)</sup>. The age, weight, presence of flap necrosis, infection, lymphoedema have all been implicated<sup>(8,3)</sup>, as well as the extent of dissection and use of radiotherapy<sup>(3)</sup>. The seroma fluid may be leaked lymph, inflammatory fluid or an exudate from the large raw surface following surgery<sup>(9)</sup>. Seroma is not unique to this form of surgery as it has been seen in patients following groin dissection or at the donor site of a myocutaneous flaps where lymphatic are not deliberately severed.

Some methods of preventing seroma from forming have been tried. They include the use of a laser scalpel<sup>(10)</sup> in the dissection in the hope of sealing the ends of the severed lymphatics, the application of a fibrin adhesive<sup>(11)</sup> or sclerosants<sup>(12)</sup> such as tetracycline, to the raw surfaces following surgery. This is intended to promote adherence of the skin flaps to the raw muscle surface. However, these methods have not shown any significant benefit. The trial using tetracycline was abandoned because of pain experienced by the patients. However, stitch obliteration of the dead space under the skin flaps<sup>(13,14)</sup> and the use of post-operative drains<sup>(15,16)</sup> have been shown to decrease seroma formation significantly. The application of stitches to tag down the flap increases operating time and is not practiced by most surgeons. The most common method currently in use is the closed suction drain. For the drains to be effective, it needs to be kept till the amount drained in 24 hours is less than 20 mLs<sup>(15)</sup>. Premature removal of the drain results in seroma accumulation<sup>(17)</sup>. However, hospitalising the patients till the drain is removed can

Department of General Surgery  
Singapore General Hospital  
Outram Road  
Singapore 169608

C Y Y Chen, MBBS,  
M Med (Surg), FRCS (Edin)  
Registrar

6 Napier Road  
#03-10  
Gleneagles Medical Centre  
Singapore 258499

A L Hoe, M Med (Surg),  
FRCS (Edin), FAMS (Glas)  
Consultant

Department of Surgery  
Singapore General Hospital  
Outram Road  
Singapore 169608

C Y Wong, M Med (Surg),  
FRCS (Edin), FAMS (Glas)  
Senior Consultant

Correspondence to:  
Dr C Y Y Chen

Department of Surgery  
Changi General Hospital  
2 Simei St 3  
Singapore 529889

be translated into increased healthcare cost<sup>(18-22)</sup>. One approach is to discharge the patients with his drain attached<sup>(18-22)</sup> and have a clinical nurse teach the patient how to empty the drain bottle and to measure the daily drainage. The patient is then given an appointment for the drainage bottle to be removed once the drainage is sufficiently low. However, getting the patient's consent can be a problem. The aim of this study was to determine whether the use of the pressure garment would be beneficial to patients in terms of improvement in the drainage following surgery, duration of drain use and seroma formation.

## METHODOLOGY

Between December 1993 and July 1994, 41 patients with breast cancer were randomised from the clinic to receive either a pressure garment to be worn after surgery or not. Patients selected to wear the pressure garment were told of the purpose of the garment and had their dimensions measured on the day of admission which was usually the day prior to surgery. Measurements were taken at the occupational therapy department of the Singapore General Hospital. The pressure garments were made of LYCRA in the shape as shown in Fig 1. A Foleys catheter balloon was then



**Fig 1** – Pressure garment for a patient with a right mastectomy.

placed in the axillary region and inflated with water to fill the axillary hollow. The garment was worn from the first post-operative day for up to 14 days at least. Daily measurements were made of the quantity of drainage from each of the drain. Removal of the drains took place when each drain was draining less than 20 mLs of fluid. Those patients who were not given a pressure garment were managed the same way as those who were given a pressure garment.

## Operative procedure

The skin flaps were raised with a diathermy pencil either in a transverse or oblique elliptical fashion, removing the nipple with the breast. The breast was freed from the pectoralis major muscle taking the fascia overlying the muscle with it. The axillary fat was excised with sharp dissection using a pair of dissecting scissors. The axillary clearance was up to Level II nodes. Minor veins were ligated and divided and the long thoracic and thoracodorsal nerves were preserved. Attempts are usually made to preserve the intercastobrachial nerve. Two Radivac drains were inserted: one to the axilla one beneath the flaps. The wound was closed using either of the two methods:

in two layers, Vicryl 1 0 to the dermis and the skin stapled together or in one layer with the skin stapled together.

## Wide excision and axillary clearance

This is usually done with two separate incisions: one skin crease incision for the lump and another following the inferior edge of the pectoralis major as it forms the anterior wall of the axilla. The lump is removed with a rim of normal tissue and the wound closed without a drain. The axilla is cleared up to Level II nodes as is described above. A Radivac drain is inserted in the axilla.

## RESULTS

The two groups were similar in composition ie. tumour size, nodal status and age. The complication rate of the pressure garment group was 15.7% and there were no patients with a seroma as a complication. This was in stark contrast to the non-pressure garment group which had a 19% complication rate with one patient with a seroma – that being the only seroma in this study.

The post-operative drainage was higher for the pressure garment group for the pectoral drains but it was higher for the non-pressure garment group in the case of the axillary drains. On the whole, the pressure garment group had a higher average total hospital drainage. This could be attributed to the slightly higher proportion of patients in the non-pressure garment group which only had a wide excision and hence the contribution of drainage from the pectoral flaps was absent in these patients.

The time taken before the Radivac drains were all removed was 6.8 days for the pressure garment group and 6.1 days for the non-pressure garment group. This was not statistically significant.

The patients were asked for their comments on the comfort level of the pressure garments they wore. Only 7 of the 19 patients felt that the garments were warm. One patient had to be excluded from the study because she had her pressure garment taken off for most part of the study period due to discomfort.

## DISCUSSION

The search for a method in preventing post-mastectomy seroma has a long history. Many methods have been developed and one approach is to seal the severed ends of the lymphatics during axillary dissection. This has been attempted with the use of a laser scalpel<sup>(10)</sup>. Unfortunately, there has not been significant improvements in post-operative drainage, which is high in patients at risk of developing a seroma. Tying the lymphatics is too tedious and has not been practiced. Encouraging adherence of the skin flaps with the raw surface of the pectoralis major after dissection by means of a fibrin glue or the use of a sclerosant has proven to be unsatisfactory. In a study using the fibrin glue, there was no significant improvement in the seroma rate<sup>(11)</sup>. The failure of this method may be the loss of the fibrin glue as it is being

**Table I**

	With the pressure garment (n = 19)	Without the pressure garment (n = 21)
Average age	50.9	52.1
Mastectomy	18	17
Wide excision	1	4
Axillary drainage (average in mLs)	346.7	264
Pectoral drainage (average in mLs)	165	170
Total hospital drainage (average in mLs)	511.7	434
T1	6	8
T2	11	11
T3	2	2
N0	7	8
N1	11	12
N2	1	1
Complication	3	4
Seroma	0	1

diluted and washed away by the exudate that is produced by the raw surfaces. In the study using tetracycline as a sclerosant, the patients experienced intolerable pain that required the study to be abandoned<sup>(12)</sup>.

Only two methods have shown significant improvement in seroma formation. These are the use of stitch obliteration of deadspace<sup>(13)</sup> and the use of drains<sup>(16)</sup>. Stitch obliteration is not commonly done possibly because of the increase in operating time that it necessitates. The application of this method is not uniform as it can vary from the use of multiple stitches to tag various parts of the flap down to the underlying muscle or simply catching the underlying muscle as the subcutaneous stitches are applied to the wound edge. Drains also have a long history starting with the open drains that Murphey first used. However, these open drains were prone to infection, and have now been superseded by the closed suction drains. It has also been shown that increased amount of drainage increases the likelihood of seroma formation<sup>(15)</sup>.

The idea of using pressure garments is not new. There are many examples of pressure being applied in post-surgery, such as the use of four layered compression bandaging in managing chronic venous ulcers; pressure dressings for wounds that are likely to bleed and the Sengstaken-Blakemore tube in oesophageal varices, to name a few. There are some pressure garments available in the market which are made of felt and shaped like a cardigan. The concept of the pressure garment is to obliterate deadspace by applying an external pressure onto the flaps and to encourage adherence of the flap to the underlying muscle.

In this study, we used custom-made pressure garments, since there was a wide variation in the build of patients and any pre-made garment would not be able to provide a close fit. LYCRA was chosen as the material for the garment because of its elasticity, however it had a draw-back of excessive warmth. The Foley's catheter balloon was incorporated into the design to provide tamponade to the axillary portion of the flap.

Unfortunately, our results did not show any improvement in the post-operative drainage with the use of the pressure garment. However there was no increase in the rate of wound dehiscence that could be associated with pressure on the skin flaps decreasing, compromising its blood supply. There was only one seroma formation in this study which occurred in the group of patients without the pressure garment. However, the significance of this cannot be ascertained because of the small size of the study population.

The choice of LYCRA as the material for such a garment may be inappropriate in our warm weather, as shown by the rejection of the garment by one of our patients and the response from 7 of the patients that the garment was too warm. An alternative material needs to be found to overcome this. The need for the garment to be custom made cannot be overemphasized, as there is a wide variation in the body habitus of the patients. The tightness of fit during the making of each garment should best be done with a pressure sensor placed over the torso of the patient. The ideal pressure should not exceed 30 mmHg at any point in order not to compromise the blood supply to the skin flaps<sup>(3)</sup>. The use of a Foley's catheter balloon to obliterate the dead space in the axilla may not be appropriate as the capacity of the balloon may be insufficient. A specially designed low pressure large capacity balloon system that can be incorporated into the garment is more appropriate should a pressure garment be contemplated for the future post-mastectomy patient.

However, in order to demonstrate that the garments are efficacious, there has to be a decrease in the post-operative drainage amount if not the seroma formation rate. In this study of a custom made pressure garment, this was not demonstrated. The problem is likely to lie with the choice of the material.

Although patients may be sent home with their drains in situ, there is still a need for the patient to maintain the drain. Alternatively, the drains can be removed before the amount drained is less than 20 mLs. However, this can lead to a high rate of seroma formation<sup>(8)</sup>. Although seromas can be easily aspirated, they can also prove to be a nuisance, requiring at times, repeated aspirations before being cleared<sup>(8)</sup>. The alternative is keeping the drains till the amount drained is less than 20 mLs<sup>(15)</sup>. Keeping the drains in situ for a long time inconveniences the patient whether the drains are managed as an out-patient or as an in-patient. Should a pressure garment prove useful in reducing post-operative drainage, this would allow the drains to be removed earlier. This is only possible with an improvement in the design of the pressure garment.

## REFERENCES

1. Lee HP, Day NE, Shanmugaaratnam K. Trends in cancer incidence in Singapore 1968-1982. (publisher not available)
2. Fentiman IS. Axillary surgery in breast cancer: What debate? *Eur J Cancer* 1993; 29A:923.
3. Say CC, Donegan W. A biostatistical evaluation of complications from mastectomy. *Surg Gynecol Obstet* 1974; 138:370-6.
4. Bryant M, Baum M. Postoperative seroma following mastectomy and axillary dissection. *Br J Surg* 1987; 74:1187.
5. Dawson I, Stam L, Heslinga JM, Kalsbeek L. Effect of shoulder immobilisation on wound seroma and shoulder dysfunction following modified radical mastectomy: a randomized prospective clinical trial. *Br J Surg* 1989; 76:311-2.
6. Flew TJ. Wound drainage following radical mastectomy: the effect of restriction of shoulder movement *Br J Surg* 1979, 66:302-5.
7. Jansen RFM, van Geel AN, de Groot HGW, Rottier AB, Olthuis GAA. Immediate versus delayed shoulder exercises after axillary lymph node dissection. *Am J Surg* 1990; 160:481-4.
8. Tejler G, Aspegren K. Complications and hospital stay after surgery for breast cancer: a prospective study of 385 patients. *Br J Surg* 1985; 72:542-4.
9. Watt-Boolsen S, Nielsen VB, Jensen J, Bak S. Postmastectomy seroma. *Danish Medical Bulletin* 1989; 36:487-9.
10. Wyman A, Rogers K. Randomized trial of laser scalpel for modified radical mastectomy. *Br J Surg* 1993; 80:871-3.
11. Uden P, Aspegren K, Balldin G, Garne JP, Larsson SA. Fibrin adhesive in radical mastectomy. *Eur J Surg* 1993; 159:263-5.
12. Sitzman JV, Dufresne C, Zuiderma GD. The use of sclerotherapy for the treatment of postmastectomy wound seroma. *Surgery* 1993; 93:345-7.
13. Dwyer PJO, O'Higgins NJ, James AG. Effect of closing dead space on incidence of seroma after mastectomy. *Surg Gynecol Obstet* 1991; 172:55-6.
14. Aitken DR, Hunsaker R, James AG. Prevention of seroma following mastectomy and axillary clearance and axillary dissection. *Surg Gynecol Obstet* 1984; 158:327-30.
15. Tadyeh K, Donegan WL. Postmastectomy and wound drainage. *Surg Gynecol Obstet* 1987; 165:483-7.
16. Somers RG, Jablon LK, Kaplan MJ, Sandler GL, Rosenblatt NK. The use of closed suction drainage after lumpectomy and axillary node dissection for breast cancer. *Ann Surg* 1992; 215:146-9.
17. Inwang R, Hamed H, Chaudary MA, Fentiman IS. A controlled trial of short-term versus standard axillary drainage after axillary clearance and iridium implant treatment of early breast cancer. *Ann RCS Engl* 1991; 73:326-8.
18. Edwards MJ, Broadwater JR, Bell JL, Ames FC, Balch CM. Economic impact of reducing hospitalisation for mastectomy patients. *Ann Surg* 1988; 208:330-6.
19. Litvak S, Borrero E, Katz R, Munoz E, Wise L. Early discharge of postmastectomy patient: Unbundling of hospital services to improve profitability under DRGs. *Am Surg* 1987; 53:577-8.
20. Cohen AM, Schaeffer N, Chen ZY, Wood WC. Early discharge after modified radical mastectomy. *Am J Surg* 1986; 151:465-7.
21. Clark JA, Kent RB. One-day hospitalization following modified radical mastectomy. *Am Surg* 1992; 58:239-42.
22. Orr RK, Ketcham AS, Robinson DS, Moffat FL, Tennant ND. Early discharge after mastectomy. *Am Surg* 1992; 58:239-42.

## 74th All India Medical Conference – MEDICON 98, Hyderabad (A.P.), on Dec 27 – 29, 1998

**Registration Fee: US \$100**

**To register, please contact:**

**Dr P Mahendra Reddy  
Organising Secretary,  
MEDICON 98**

**74th All India Medical Conference**

**IMA Building, Esamia Bazar,  
Hyderabad – 500 027, (A.P.)**

**Telephones : (91) 40-4656378, 4732383, 4609520, 231429**