

# Feracrylum does not Reduce the Incidence of Seroma Formation after Modified Radical Mastectomy

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## Abstract

**Background:** Seroma formation, a common complication after mastectomy, may necessitate many hospital visits, carries an increased risk of infection and may delay adjuvant treatment. Many different unsuccessful procedures have been tried to prevent seroma. The aim of this study was to determine whether feracrylum can reduce seroma formation after mastectomy. **Methods:** A double blinded prospective randomized controlled study, with 2 groups of 24 patients each, was conducted with one exposed to feracrylum and the other a control group.

**Results:** Seroma rate was 88% in the feracrylum group while it was 38% in the control group ( $p < 0.0001$ ). The mean volume of drainage was less with feracrylum 695ml vs. 1486ml ( $p < 0.0001$ ). There was significant reduction in the days of drain retention 5.9 vs. 12.8 ( $p < 0.0001$ ), and the rate of wound related complications 8% vs. 7.1% in the feracrylum group ( $p < 0.0001$ ). **Conclusion:** Feracrylum does not reduce the incidence of seroma after mastectomy but it reduces the total volume of drainage and the rate of wound complications.

**Key Words:** Seroma, Mastectomy, Breast cancer

## Introduction

Breast cancer is the most common malignancy in women worldwide and surgery is an important aspect of treatment (1). Modified radical mastectomy (MRM) is associated with numerous complications including seroma formation, the most common complication (1,2). Seroma is associated with skin stretching, patient discomfort, infection and prolongation of hospital stay. When it occurs post-operatively, this may require multiple visits for aspiration (3).

Multiplicities of techniques have been tried in attempt to control seroma formation following mastectomy. Among them are; shoulder immobilization, use of fibrin sealant, various drain regimens and dead space obliteration with no success. Feracrylum, a coagulant, is an incomplete iron salt of polyacrylic acid. Within a pH range of 2.9 - 4, it forms water insoluble complexes with proteins of various origins including those contained in blood plasma. It has not been used to control seroma after mastectomy though it has been shown to reduce post-operative fluid collection following dental, orthopedic and laparoscopic procedures (4).

The aim of this study was to determine whether

Feracrylum leads to a reduction in the frequency of seroma formation following mastectomy.

## Methods

A double blinded prospective randomized controlled trial including all breast cancer patients undergoing modified radical mastectomy at Kenyatta National hospital was conducted between May and September 2010. Patients booked for breast conservation and those with severe comorbid conditions (hypertension, diabetes and immunosuppression) were excluded. Sample size calculation was done to detect a 40% reduction in the number of patients developing seroma after mastectomy with feracrylum compared to those without use of feracrylum, with a  $\alpha$  of 0.05 and a power of 80%. This is because it has been established in previous studies that with use of drains alone there is a 25% reduction of seroma formation (5). It is of clinical relevance if a 40% reduction for those in the study group (65% of the subjects will have a successful outcome). A sample size of 42 patients was arrived at (21 patients per group).

All eligible persons were randomly assigned to two groups by using a computer generated code. The patients and investigators were blinded. A

research assistant assigned the patients to either group A or B. Group 'A' underwent MRM plus tube drainage. Group 'B' underwent MRM, tube drainage plus 50ml of 1% Feracrylum with a contact time of 5 minutes before wound closure. Drains were of equal calibre and had the same number of holes. No suction pressure was applied. The drains were placed under the chest and axillary flaps. Shoulder immobilization was not practiced in both groups. The surgery was conducted by different surgeons as part of their normal surgical practice. Dissected breast and axillary lymph nodes were taken to a pathologist for assessment of tumour size and node status. Post-operatively, volume drainage was recorded daily for the two groups. Drain removal was performed when drainage was less than 30ml per day for two consecutive days. Patients were reviewed on day 14 and 21 after discharge. The diagnosis of seroma was made clinically when a collection was detected beneath the skin flaps. In those with evident collection, a diagnostic and therapeutic aspiration was performed under sterile conditions. The volume of each aspirate was noted. Repeat aspirations were performed weekly until no collection was detected. Data were compared in both groups. Student's t-test was used for comparing the continuous variables and chi-square or Fisher's exact test for categorical variables.

## Results

Forty eight female patients with breast cancer undergoing MRM at KNH were enrolled in our study. Each treatment group had 24 patients each. There was no significant difference in the treatment and control groups in terms of age of the patient, weight, blood pressure, experience of operating surgeon (they were classified as either consultants or residents depending on whether the surgeon was a qualified or a trainee surgeon), node status and tumour size as shown in Table 1.

**Table 1: Descriptive statistics for both the treatment and control groups**

Description	Treatment Group	Control Group	P value
Mean age (years)	51.3	47.8	0.25
Mean weight (kg)	65.5	64.9	0.90
Systolic Blood Pressure	128	127	0.88
Node positive(%)	13(54)	14(48)	
Tumour Size	4.7	5.1	0.15
<b>Surgeon's experience</b>			
Consultant (%)	13(54)	11(46)	0.76
Registrar	11(46)	13(54)	0.81

There was a significant difference ( $p < 0.0001$ ) in the number of days drains were required, with the treatment group (feracrylum) being shorter (5.9vs. 12.8). In addition there was also a significant difference in the total volume of drainage, with treatment having less (695 vs. 1486;  $p < 0.0001$ ). By the 14th post operative day 11(46%) patients had developed seroma in the treatment group while none (0) had developed in the control group. By the 21st day, 21(88%) patients in the treatment group had developed seroma but only 9(38%) in the control group had seroma. This difference was significant ( $p < 0.0001$ ). Those patients in the treatment group who developed seroma required an average of 4 aspirations to drain the seroma while the control group required one aspiration ( $p < 0.0001$ ).

No patient in the study developed major complication (e.g. flap necrosis). Two (8%) of the patients in the treatment group developed wound infection requiring outpatient antibiotic treatment while the control group had 15(71%) patients with infection mainly at the drain site (Table 2).

**Table 2: Results of drain retention, total volume, seroma and complications.**

Description	Treatment Group	Control Group	P Value
Number of days drain retained	5.9	12.8	< 0.0001
Total volume of drainage (mls)	695	1486	< 0.0001
No of Patients with seroma at day 14 (%)	11 (46%)	0 (0%)	< 0.001
No of Patients with seroma at day 21 (%)	21 (88%)	9 (38%)	< 0.001
Complication(s)	2 (8%)	15(71%)	< 0.001
No. of aspirations	3.6	0.7	< 0.0001

Since there was a significant difference observed between the feracrylum and the control group, in terms of total volume of drainage a multivariate analysis was performed to evaluate the association between the various clinic-pathological factors and the total volume of drainage. There was no association between the age, the weight, systolic blood pressure, tumour size, tumour stage, surgeon's experience and the total volume of drainage (Table 3).

**Table 3: Regression analysis of total volume of drainage**

Total volume	Coefficient	Std Error	T	p>   t	95% Confidence Interval	
Treatment	-741.003	130.596	-5.67	0	1005.159	-476.847
Age	11.39	8.337	1.37	0.18	-5.466	28.247
Weight	-1.876	7.124	-0.26	0.794	-16.286	12.533
Sbp	-5.277	8.07	-0.65	0.517	-21.6	11.045
t-stage	-107.471	83.857	-1.28	0.208	-277.09	62.149
t-size (cm)	68.474	63.1	1.09	0.285	-59.158	196.106
Surgeon Consultant	181.689	115.397	1.57	0.123	-51.725	415.102
Resident	1340.812	721.269	1.86	0.071	-118.09	2799714

Multivariate analysis was also performed to evaluate the association between the significant difference in seroma formation at day 21 observed in the feracrylum and the control group with respect to the various

clinico-pathological factors. There was no association between the age, weight, systolic blood pressure, tumour size, tumour stage, surgeon's experience and the incidence of seroma (Table 4).

**Table 4: Regression analysis of seroma formation at day 21**

Day 21	Coefficient	Std Error	T	p>   t	95% Confidence. Interval	
Treatment	0.57	0.14	4.19	0	0.29	0.84
Age	-0.01	0.01	-0.77	0.45	-0.02	0.01
Weight	0.01	0.01	0.72	0.49	-0.01	0.02
Sbp	0.01	0.01	0.62	0.54	-0.01	0.02
t-stage	-0.09	0.09	-1.07	0.29	-0.27	0.08
t-size	0.05	0.07	0.82	0.41	-0.08	0.19
Surgeon Consultant	0.06	0.12	0.47	0.64	-0.19	0.3
Resident	-0.48	0.75	-0.64	0.53	-2	1.04

## Discussion

The main aim of this study was to determine the effect of feracrylum on seroma after modified radical mastectomy. The prevalence of seroma was 38% and 88% in the control group and treatment group respectively. However an important observation derived from the treatment group was a large increase in seroma formation associated with early drain removal (5.9 vs.12.8 days  $p < 0.0001$ ). This is distinctly different from the study by Barwell et al who found the prevalence at 51% after drain retention for one week and concluded that drain retention for a longer time did not protect against seroma formation (6). We established that patients' age and weight do not affect the incidence of seroma after mastectomy. Vivek et al agree that no patient or tumor factors seem to affect seroma formation except body mass index and body weight (7). There was no relationship between the incidence of seroma versus tumour size, lymph node status, blood pressure, and surgeon's experience. This agrees with the study by Gonzalez

et al, who in 2003 did a retrospective analysis of 359 patients, majority of whom underwent modified radical mastectomy for breast cancer (8). They further concluded that seroma formation is unpredictable occurrence in a predictable number of patients. However, these findings contradict those of Lumachi et al in 2004 which showed that tumour size as the principle factor influencing seroma formation (9). Feracrylum was associated with a significant reduction in the total volume of drainage (695ml and 1486ml in the control group). This agrees with study of Bhonsali who used feracrylum to reduce post-operative fluid collection following dental, orthopaedic and laparoscopic procedures. (4). This effect could be due to plugging of small blood and lymphatic vessels in a manner similar to how Vaishnav used feracrylum to arrest bleeding from small veins and capillaries in neurosurgical and orthopaedic procedures (10). Feracrylum use was associated with a significant reduction in the number of days necessary for drain retention (5.9 vs. 12.8). This could be because of its

ability to coagulate plasma proteins leading to reduced post-operative drainage. While this was an advantage in that it reduced the days of hospital stay and overall hospital bill, as patients were discharged home after drain removal, it was associated with a high incidence of seroma formation. Probably because feracrylum coagulates serum proteins it led to obstruction of drain holes leading to reduced drain output and hence early removal. This was associated with several outpatient visits, and multiple skin punctures (3.6 vs. 0.7) to drain the seroma. Our findings correspond with other studies performed to investigate other chemical agents and seroma. Vexman in his study showed that fibrin glue increased the incidence of seroma (11). A meta-analysis done in 2006 concluded that there was no evidence to support the use of fibrin sealant in breast cancer surgery to reduce postoperative drainage or seroma formation (12).

Our study demonstrates that drain retention for a long time was associated with significant reduction in the incidence of seroma (38% vs. 88%), but did not abolish seroma completely. On the other hand it was associated with a higher frequency of wound related complications (71% vs. 8%). This corresponds with other studies that have showed drain retention for a long duration to be associated with longer post-operative hospital stay, cause more pain after surgery, interfere with mobility and serve as potential routes for infection (11).

## Conclusion

Although feracrylum did not reduce the prevalence of seroma after modified radical mastectomy, it was associated with significant reduction in the total volume of drainage, reduced number of days necessary for post operative retention of drains and wound related complications. However, it resulted in increased frequency of late seroma formation.

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