

Original article

Evaluation of Prognostic Factors Involved in Seroma Formation after Radical Surgery for Breast Cancer

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SUMMARY

Seromas belong to common postoperative complications in breast surgery, with the prevalence rate from 3% to 60%.

Our aim in this paper was to establish the factors most significant in the occurrence of seroma after radical surgery for breast cancer.

The study employed a prospective non-randomized design and took place at the General Surgery Clinic, Clinical Center Niš. The studied group comprised 100 female patients with diagnosed primary breast cancer. All the patients underwent radical surgery – modified radical mastectomy according to Madden.

The following patient factors were observed: age, body mass index (BMI), disease stage, median primary tumor size at diagnosis, cancer-involved retrieved nodes, neoadjuvant chemotherapy, dissection technique (cautery/scalpel), estimated blood loss, drainage on the last day (in ml) and duration of surgery. Seroma was defined as any clinically detected collection of fluid under the flaps.

Seromas were identified in 21 patients. BMI was the factor most significant in the formation of seroma in our study – OR 1.39, CI (1.058–2.65), and the following factors were also statistically significant: dissection technique – OR 1.76, CI (1.17–7.67), and total duration of drainage of the surgical wound – OR 1.12, CI (1.06–2.41)

Surgery is the most important aspect of breast cancer treatment. The rate of postoperative complications after breast surgery for cancer is relatively low. In our study, BMI had the greatest predictive significance for seroma formation, followed by the parameters such as dissection technique and total duration of drainage of the surgical wound as statistically significant as well.

Key words: breast surgery, seroma, risk factors

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INTRODUCTION

The breast is an organ readily accessible for examination and convenient for surgical interventions due to its anatomical localization on the anterior chest wall. A good access to the armpit also enables comfortable surgical work. Regardless of these facts, surgical interventions on the breast are associated with certain complications which may cause significant discomfort to the patients. These complications are usually minimal in specialized surgical centers with well trained surgeons, and generally do not require any special surgical treatment.

Seromas belong to common postoperative complications in breast surgery, with the prevalence rate from 3% to 60% (1). Seroma represents a collection of serous fluid accumulated during the formation of skin flaps in radical mastectomy or they occur in the newly created dead space after axillary dissection. The incidence of seroma correlates with patient age (2), breast volume and hypertension (3), presence of axillary lymph nodes involved with malignancy (4), their number (5), previous breast biopsies (6) and use of heparin (7). Seromas may also be associated with the employed surgical technique. Use of electrocauterization (8, 1) may reduce the amount of blood lost during mastectomy, but may also increase the incidence rate of seromas.

Our aim in this paper was to establish the factors most significant in the occurrence of seroma after radical surgery for breast cancer.

MATERIAL AND METHODS

The study employed a prospective non-randomized design and took place at the General Surgery Clinic, Clinical Center Niš, in the period from April 1, 2015 to April 1, 2016. The studied group comprised 100 female patients with diagnosed primary breast cancer. All the patients underwent radical surgery – modified radical mastectomy according to Madden. The surgical intervention involved level I-II/I-III axillary dissection, depending on the degree of tumor dissemination. In all the patients, vacuum drainage of the axillary bed and/or breast bed was performed. The axillary drain was removed when the amount of drained fluid had dropped below 30 ml a day.

All the patients were given 3.0 g prophylactic Cefuroxim two hours before surgery.

The following patient factors were observed: age, body mass index (BMI), disease stage, median primary tumor size at diagnosis, cancer-involved retrieved

nodes, neoadjuvant chemotherapy, dissection technique (cautery/scalpel), estimated blood loss, drainage on the last day (in ml) and duration of surgery. Seroma was defined as any clinically detected collection of fluid under the flaps.

PROCESSING OF THE RESULTS

The obtained results were processed using the binary logistic regression model (enter model). The predictive value of individual parameters was determined using the Cox and Snell R-square model. MS Office Excel 2002 in the MS Windows XP environment was used, and the results were tabularly presented.

RESULTS

The study involved 100 female patients with primary breast cancer in whom modified radical mastectomy according to Madden was performed. Seromas were identified in 21 patients. Table 1 presents clinical characteristics of the patients (divided into those with and those without seroma).

The significance of prognostic factors in the occurrence of seromas after radical surgery for breast cancer was analyzed (enter model). Table 2 presents the predictive significance of factors such as patient age, BMI, tumor size, number of malignant lymph nodes in the axilla, dissection technique, total amount of blood lost during the operation, and duration of drainage, in the occurrence of seroma in patients undergoing radical surgery.

BMI was the factor most significant in the formation of seroma in our study - OR 1.39, CI (1.058-2.65), and the following factors were also statistically significant: dissection technique - OR 1.76, CI (1.17-7.67) and total duration of drainage of the surgical wound - OR 1.12, CI (1.06-2.41) (Table 2).

DISCUSSION

Seroma is one of the most common postoperative complications in breast surgery (9). There have been numerous recommendations addressing the prevention of this complication. The incidence of seroma correlates with patient age (2), breast volume, hypertension (10), presence of malignant lymph nodes in the axilla (11), previous surgical biopsies (11), and use of heparin (10). The use of Tamoxifen may incite the creation of serous formations between the skin flaps in the anterior chest wall, most probably as the consequence of inhibition of collagen synthesis in its initial stages (13).

Table 1. Patient clinical characteristics

	Seroma (n = 21)	No seroma (n = 79)
Age		
Median	50.46 years	52.16 years
Range	25-78 years	27-73 years
Body mass index	29.42 ± 8.54	24.42 ± 6.55
Stage		
0	1 (4.76%)	3 (3.80%)
I	6 (28.57%)	21 (26.58%)
II	10 (47.62%)	37 (46.83%)
IIIa	4 (19.05%)	18 (22.79%)
Median primary tumor size at diagnosis	3.10 cm	2.89 cm
Cancer involved retrieved nodes		
≤ 10	17 (80.95%)	62 (78.47%)
> 10	4 (19.05%)	17 (21.52%)
Neoadjuvant chemotherapy	11 (52.38%)	39 (49.37%)
Dissection technique		
Cautery	11(52.38%)	50 (63.21%)
Scalpel	10 (47.62%)	29 (36.79%)
Estimated blood loss (mL)	103 ± 39	99 ± 30
Duration of drains (days)	4 ± 2	5 ± 1
Drainage last day (mL)		
Drain 1	37 ± 47	29 ± 20
Drain 2	29 ± 18	27 ± 20
Duration of surgery (in min)		
≤ 90	16 (76.20%)	58 (73.42%)
> 90	5 (23.80%)	21 (26.58%)

To date, the origin of seroma has not been sufficiently elucidated. Watt-Boolsen (6) has suggested that seroma is an exudate originating from acute inflammatory reaction. Oertli et al. (7) have demonstrated that fibrinolytic activity in the serum and lymph may greatly influence the amount of the fluid drained. They showed that tranexamic acid was an antifibrinolytic agent, reducing the amount of drained serous fluid both peri- and postoperatively. Bonnema et al. have reported that the level of fibrinogen in the serum is very low compared to the level of fibrinogen in the plasma on the first postoperative day. Fibrinogen could not be detected by mea-

surements on the fifth and tenth postoperative day (12). This group of authors hypothesized that serum originated from lymph (13).

Some of the studies have shown that the onset and manifestation of seroma clearly correlates with the surgical technique itself (14). Use of electrocautery (8, 1) reduces intraoperative blood loss, but also enhances the occurrence of serous fluid and prolongs the total drainage period. Argon diathermy and use of laser scalpel produces similar seroma volumes as scalpel dissection does (15, 16).

Table 2. Cox and Snell R-square model of characteristics potentially associated with postoperative seroma formation

	B	S.E.	Wald	Sig.	Exp (B)	95.0% C.I. for EXP (B)	
						Lower	Upper
Age	-0.335	1.122	0.073	0.764	0.712	0.066	7.872
BMI	0.939	.977	0.923	0.337	1.391	1.058	2.655
Disease stage	0.146	0.782	0.029	0.846	1.166	0.210	6.567
No. of malignant axillary lymph nodes	0.846	0.822	1.143	0.267	2.411	0.488	11.799
Dissection technique	-0.273	1.179	0.054	0.817	1.761	1.17	7.674
Amount of lost blood	1.244	1.699	0.477	0.469	3.434	0.011	14.442
Drainage duration	2.102	1.521	1.908	0.167	1.122	1.006	2.411

In our examinees, BMI had the greatest predictive significance for the occurrence of seroma - OR 1.39, CI (1.058-2.65), and the following factors were also statistically significant: dissection technique - OR 1.76, CI (1.17-7.67) and total duration of drainage of the surgical wound - OR 1.12, CI (1.06-2.41). These data clearly correlated with the studies mentioned above. Therefore, special care should be taken in the obese patients, since they are more susceptible to seroma formation and consequential surgical wound infection. Our study demonstrated as well that the surgical technique employed was a significant predictive factor in seroma formation. The use of thermocautery in our patient series had as a consequence more voluminous seromas. This could be explained by the use of inadequate, out-of-date electrocautery for dissection, leading to necrosis and thermo-coagulation of a markedly deeper layer of tissue (even exceeding 5 mm in depth), which produced a larger than necessary burnt and destructed area. All of these resulted eventually in the formation of more voluminous seromas and much more stronger postoperative pain. Wound healing in the affected patients also took much longer time.

A very important parameter of seroma formation is the duration of drainage of the surgical wound as well. The routine practice is to remove the drain from the wound when the total amount of drained fluid drops to 20-50 ml a day (17). In the period of 48 hours after surgery, 74% of the total amount of the drained seroma

accumulates (18). The drain may be safely removed if the total amount of drained fluid in the first three days is below 250 ml (19). In their study of 227 patients with axillary dissection, Somers et al. (20) removed the axillary drain on the first postoperative day in the group of 108 patients with I and II level axillary dissection, regardless of the amount of drained contents; in the second group of patients in whom axillary drainage was not performed, aspiration of the serous fluid accumulating in the axilla was done during postoperative follow-up. The study showed that there was no statistically significant difference in the volume of drained contents between these two groups of patients.

Inwang et al. (21) have randomized 84 patients for drain removal when the total amount of drained fluid a day reached 20 ml on two consecutive days and for drain removal on the fifth postoperative day. There was not any statistically significant difference in the number of percutaneous aspirations, postoperative complications.

Yi et al. (22) have compared drain removal in two groups of patients. In the first group, drain was removed 48 hours after surgery, while in the second drain was removed following the „standard“ protocol. There was not any statistically significant difference in the incidence of serous formations between the studied groups.

Liu et al. (23) have removed drain 23 hours after surgery in 50 patients with axillary dissection. The total

rate of seroma formation was 2%, i.e. 49 out of 50 patients did not develop symptomatic seromas.

Based on these studies, we may conclude that early drain removal does not affect seroma formation. Our study as well demonstrated that the duration of drainage affected seroma formation, so that based on the available facts, long-lasting drainage should be avoided.

Physical closure of the dead space occurring in axillary dissection reduces seroma volume, but the studies dealing with the problem were not able to show any additional benefits in terms of cosmesis or upper limb mobility.

The use of thrombin sprays, sclerotherapy and mechanical pressure has not reduced the total volume of drained serous fluid.

The use of the closed vacuum system has been shown to be better compared to the open drainage system. In the available literature, multiple drainage has not been shown to be advantageous. Higher pressure vacuum drainage has produced better results compared to the usual suction drainage.

Surgery is the most important aspect of breast cancer treatment. The rate of postoperative complications after breast surgery for cancer is relatively low. In our study, BMI had the greatest predictive significance for seroma formation, followed by the parameters such as dissection technique and total duration of drainage of the surgical wound as statistically significant as well.

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Procena faktora rizika za nastanak seroma nakon radikalnih hirurških intervencija karcinoma dojke

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SAŽETAK

Seromi predstavljaju česte postoperativne komplikacije nakon operacije dojke. Prevalencija seroma kreće se od 3% do 60%.

Cilj rada bio je utvrđivanje najznačajnijih faktora rizika za pojavu seroma nakon radikalne operacije karcinoma dojke.

Prospektivna, nerandomizovana studija obuhvatila je 100 bolesnica sa primarnim karcinomom dojke operisanih na Klinici za opštu hirurgiju Kliničkog centra Niš. Sve bolesnice bile su podvrgnute modifikovanoj radikalnoj mastektomiji prema Madden-u.

Praćeni su sledeći parametri: starost, indeks telesne mase (BMI), stadijum bolesti, veličina tumora, stanje limfnih nodusa aksile, primenjena neoadjuvantna hemoterapija, disekciona tehnika (kauter / skalpel), procenjeni gubici krvi, količina drenirane tečnosti (u ml) i dužina operacije. Serom je definisan kao bilo koja klinički detektovana tečnost dobijena iz postoperativne rane.

Kod 21 bolesnice bio je prisutan serom. U našoj studiji BMI bio je najznačajniji faktor rizika za formiranje seruma - OR 1,39; CI (1,058-2,65), dok su statističku značajnost pokazali: disekciona tehnika - OR 1,76; CI (1,17-7,67) i ukupno trajanje drenaže hirurške rane - OR 1,12; CI (1,06-2,41).

Hirurgija je najvažniji aspekt lečenja karcinoma dojke. Stopa postoperativnih komplikacija nakon operacije karcinoma dojke je relativno niska. U našoj studiji, BMI je imao najveći prediktivni značaj za formiranje seroma. Statističku značajnost su pokazali i disekciona tehnika i ukupno trajanje drenaže hirurške rane.

Ključne reči: hirurgija dojke, serom, faktori rizika