



# Day surgery in reduction mammoplasty - saving money or increasing complications?

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## KEYWORDS

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**Summary Background:** The benefits of reduction mammoplasty procedures have been reported previously. However, to control the rise in public healthcare costs, we need to find ways of conducting these procedures safely and more cost-effectively. Our aim was to examine whether reduction mammoplasty performed in an outpatient setting has comparable surgical complication rates to those performed in an inpatient setting. We also investigated whether any savings gained from day surgery are still present after any possible indirect costs are considered.

**Methods:** The study population comprised 276 patients who underwent reduction mammoplasty in a single center between January 2019 and February 2021. Data were collected from patient medical records. The costs associated with the primary procedure and any possible additional expenses were calculated. Basic statistical comparisons were performed for propensity score-matched data.

**Results:** Complication rates, readmissions, number of contacts to the health care system, and need for additional surgical interventions were comparable between outpatients and inpatients. The basic costs for outpatients were 2990 euros per patient and 3923 euros for inpatients. Total costs after possible extra expenses were lower in day surgery as it was markedly more cost-effective than patients treated as inpatients.

**Conclusions:** Reduction mammoplasties can be safely performed in an outpatient setting. Moreover, the emergence of complications is comparable to those performed in an inpatient setting. An outpatient setting produced significant cost savings not only in the immediate costs of primary surgery but also in the costs associated with possible complications and extra contacts to the healthcare system.

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## Introduction

Reduction mammoplasty is one of the most common procedures in plastic surgery. Patients with breast hypertrophy suffer from a broad spectrum of symptoms, including neck and upper back pain, headache, aching shoulders, painful shoulder grooves, low back pain, intertrigo of the inframammary crease, mastalgia, poor posture, and difficulty in exercising.<sup>1,2</sup> Moreover, it has been shown that breast reduction surgery significantly improves the breast-related quality of life in women.<sup>3</sup>

Increasing costs in public healthcare are a major problem that needs to be addressed. Resources must be properly targeted and their use assessed on a regular basis. Outpatient surgery is an attractive option for reducing costs. A major factor that has enabled the transition from an inpatient to an outpatient setting is the improvement in anesthetic techniques that facilitate the safer delivery of drugs and minimize the need for postoperative monitoring.<sup>4</sup> Since reduction mammoplasty is a common procedure in plastic surgery, cost reductions in these procedures could have a significant impact on lowering costs. However, patient safety needs to be the leading factor when determining whether this kind of practice is reasonable. Moreover, if the rates of unplanned readmissions or complications are unacceptably high, the savings gained in performing surgery in an outpatient setting might be lost.

There are data that support the safety of outpatient reduction mammoplasty. For example, in population-level data from the United States, outpatient breast reduction is shown to be equally as safe when compared to 23-h observation or admission. It was also reported that the median costs of inpatient breast reduction mammoplasty were between 148 and 220% more than the costs of outpatient reduction mammoplasty.<sup>4</sup> Moreover, it has also been shown that unplanned readmissions after outpatient plastic surgery are infrequent, and the rate of 1.95% compares favorably with the rates of readmission among other specialties.<sup>5</sup>

At Tampere University Hospital (Finland), we transferred from an inpatient to an outpatient setting in reduction mammoplasties in February 2020. The aim of the current study is to assess patient safety and the consequences in costs due to this transformation. Our objective is to consider not only the immediate costs of surgery but also to calculate the indirect costs of possible readmissions, surgical complications, outpatient visits, and elective corrective procedures.

## Patients and methods

The current study is a retrospective study based on the medical records of patients. The study population comprises 276 patients who underwent reduction mammoplasty in the department of plastic surgery at Tampere University Hospital between January 2019 and February 2021. The follow-up period was performed until May 31, 2021, and the minimum follow-up time was 3 months. Patients were routinely operated in an inpatient setting until February 2020. After that, reduction mammoplasties were conducted as day surgery procedures, unless the patient had a medical condition (American Society of Anesthesiologists (ASA) class 3-4)

requiring overnight admittance or they could not arrange for an adult to be with them for the following night. All the patients included in the study were operated by plastic surgeons or plastic surgery residents who had at least three years of plastic surgery training. Permission for the study was given by the Science Center of Tampere University Hospital. The study was reported according to the STROBE guidelines.

From the patient medical records, we gathered patient characteristics (age, BMI, comorbidities, smoking status, nipple to sternal notch distance, and weight of the resected tissue), operative technique (the skin incision and the used pedicle), whether the patient was treated in an outpatient or inpatient setting, complications according to the Clavien-Dindo classification, unplanned admissions and readmissions, unplanned operations (hematoma and infection), number of visits to the wound care outpatient clinic, number of visits to the emergency unit, and the need for late corrections (e.g., dog ears). We calculated the total direct costs resulting from the primary procedure itself and any possible indirect costs (unplanned admissions, readmissions, outpatient visits, and surgeries).

## Statistics

Single nearest neighbor propensity score matching (i.e., 1:1) for age, body mass index (BMI), and resected tissue within a match tolerance of 0.05 without replacement was performed for data on the breast reduction patients due to the statistical significance in demographic factors (Table 1). Further analyses were performed for matched data. Differences between categorical factors between outpatient and inpatient reduction mammoplasty patients were tested using the Pearson Chi-Square test or Fisher's Exact test. Due to the skew distributions, a nonparametric independent-samples Mann-Whitney test was performed as exact if appropriate. A p-value of < 0.05 was considered statistically significant. IBM SPSS Statistics version 26.0 for Windows software (SPSS Inc., Chicago, Illinois, USA) was used for the statistical analyses.

## Results

A total of 276 reduction mammoplasties were performed during the study period. Of these, 162 were performed in an outpatient setting and 114 in a planned inpatient setting. Nine (6%) outpatients had an unplanned admission due to hematoma ( $n = 4$ ), pain ( $n = 3$ ), or other reason such as nausea ( $n = 2$ ). Readmission after the patient had already been discharged from the hospital was a rare event in both groups. No difference could be seen in the number of readmissions between the groups ( $p = 0.245$ ).

Demographics of the outpatients and inpatients who underwent reduction mammoplasty are presented in Table 1. Inpatients had more often cardiovascular diseases and diseases classified as other diseases than outpatients. BMI and the amount of resection seemed to be greater in inpatients than in outpatients. However, when matched, these differences disappeared. Due to the study design, the follow-up time was longer in the inpatient group (median 19 months,

**Table 1** Demographics of breast reduction patients (unmatched and matched).

	Original data				p-value	Propensity score matched data				
	Day surgery (n = 162)		Inpatient reduction mammoplasty (n = 114)			Day surgery (n = 101)		Inpatient reduction mammoplasty (n = 101)		p-value
<b>Age, years</b>										
Median (InterQuartile Range)	42	(31-55)	51	(43-58)	<0.001	50	(40-59)	50	(39-57)	0.330
<50, n (%)	107	(66)	55	(48)	0.003	51	(51)	55	(55)	0.573
<b>Body Mass Index*, Md (IQR)</b>	27.6	(26.0-29.3)	28.2	(26.2-30.0)	0.035	28.0	(26.6-29.3)	28.0	(26.0-30.0)	0.450
<b>N-SN**, centimeters, Md (Range)</b>										
Right breast	30.0	(24.0-36.0)	31.0	(22.0-44.0)	0.029	30.5	(24.0-36.0)	31.0	(22.0-44.0)	0.445
Left breast	30.5	(24.0-37.0)	31.0	(22.0-44.0)	0.062	31.0	(24.5-37.0)	31.0	(22.0-44.0)	0.965
<b>Tissue resected, grams, Md (IQR)</b>										
Right breast	462	(349-619)	501	(389-674)	0.036	452	(350-601)	500	(381-654)	0.082
Left breast	485	(339-625)	519	(398-712)	0.072	500	(346-629)	510	(395-675)	0.225
<b>Smoking, n (%)</b>	6	(4)	2	(2)	0.577	2	(2)	2	(2)	1.000
<b>Comorbidities, n (%)</b>										
Cardiovascular diseases	17	(11)	28	(25)	0.002	14	(14)	16	(16)	0.692
Asthma/COPD	16	(10)	10	(9)	0.757	9	(9)	6	(6)	0.421
Diabetes Mellitus	7	(4)	3	(3)	0.460	6	(6)	1	(1)	0.118
Hypothyroidism	14	(9)	17	(15)	0.108	9	(9)	14	(14)	0.279
Fibromyalgia	1	(<1)	2	(2)		1	(1)	2	(2)	
Sleep apnea	1	(<1)	3	(3)		1	(1)	2	(2)	
Rheumatoid arthritis	2	(1)	6	(5)		0		5	(5)	
Crohn's disease	3	(2)	0			2	(2)	0		
Epilepsy	0		2	(2)		0		2	(2)	
Renal insufficiency	0		2	(2)		0		1	(1)	
Osteoporosis	0		2	(2)		0		0		
Other disease*	5	(3)	13	(11)	0.006	5	(5)	8	(8)	0.400

Differences between patient groups were tested using Mann-Whitney test, Pearson Chi-Square test or Fisher's Exact test.

\* n = 1 for all diseases: cerebrovascular attack, collagen colitis, bradycardia, aortic valve stenosis, sick sinus syndrome, osteoarthritis, migraine, sjogren's syndrome, pulmonary fibrosis, mental disability, IgA nephropathy, mucopolysaccharidosis 4B, APC resistance.

**Table 2** Complications of breast reduction patients (matched  $N = 202$ ).

	Day surgery ( $n = 101$ )		Inpatient reduction mammoplasty ( $n = 101$ )		$p$ -value
<b>Pedicle, n (%)</b>					0.428
Medial	87	(86)	81	(80)	
Inferior	12	(12)	19	(19)	
Superior	2	(2)	1	(1)	
<b>Complication, n (%)</b>					0.074
No	67	(66)	52	(55)	
Minor	29	(29)	45	(45)	
Major	5	(5)	4	(4)	

Differences between patient groups were tested using Pearson Chi-Square test or Fisher's Exact test.

**Table 3** Unplanned contacts to healthcare after discharge from the primary operation (matched  $N = 202$ ).

	Day surgery ( $n = 101$ )		Inpatient reduction mammoplasty ( $n = 101$ )		$p$ -value
Late corrective operations, n (%)	6	(6)	9	(9)	0.421
Readmission, n (%)	4	(4)	1	(1)	0.369
Wound care clinic, n (%)	20	(20)	56	(55)	<0.001
Visits in wound care clinic, Median (Range)	0	(0-7)	1	(0-4)	<0.001
Emergency department, n (%)	11	(11)	11	(11)	1.000

Differences between patient groups were tested using Pearson Chi-Square test, Fisher's Exact test, or Independent-samples Mann-Whitney  $U$  test.

interquartile range 17-24) than in the outpatient group (median 8.4, IQR 5.8-12.8 months). However, the scope of the current study was to examine the acute complication rates, and therefore the events under study occurred well within even the shortest follow-up time.

Complications were rated according to the Clavien-Dindo classification. The complication rate in the outpatient group seemed to be lower than in the inpatient group (Table 2). Minor complications included wound healing problems, superficial infections, and seroma. Major complications included tissue necrosis, hematoma, and deep infection requiring surgery. When a complication occurred that required surgical intervention, the operation was performed in an inpatient setting in both groups. Patients being discharged as outpatients did not lead to more visits to the emergency department nor a higher number of emergency surgeries (e.g., for hematoma or infection). The number of outpatients requiring visits to the wound care clinic was lower than that of those patients treated as inpatients ( $p < 0.001$ ). Six (6%) outpatients and nine (9%) planned inpatients underwent later corrective operations (e.g., dog ear excision), with no statistical difference between the two groups (Table 3).

Reduction mammoplasty performed in an outpatient setting was significantly more affordable than when performed in an inpatient setting. The basic cost per patient for the procedure was 2990 euros in an outpatient setting and 3923 euros in an inpatient setting. We also calculated the costs associated with any possible unplanned admissions, readmissions, complications, visits to the emergency department, visits to the wound care clinic, emergency surgeries, and later corrective surgeries. Both the planned and total costs of surgery performed in an outpatient setting were much lower than surgery performed in an inpatient setting ( $p < 0.001$ ), making it markedly more cost-effective than patients treated as inpatients (Table 4).

## Discussion

Surgical treatment of breast hypertrophy has a positive and significant effect on health-related quality of life, including pain, physical and psychological function, and breast appearance.<sup>6,7</sup> Considering this positive effect on the well-being of patients, the cost burden of reduction mammoplasty on the public healthcare system can be vindicated. However, to control the rise in healthcare related costs, we need to find ways to reduce the costs without increasing the risk of complications. Some published studies support the finding that outpatient reduction mammoplasty per se is cheaper than the same procedure performed in an inpatient setting.<sup>4,8</sup> However, if complications increase or patients feel the need to return to the emergency department or wound care clinic more frequently, any savings might be lost.

During the first half of our study period, all patients routinely stayed overnight at the hospital. However, since February 2020 to the end of the study period, reduction mammoplasties were conducted as day surgeries, unless the patient had comorbidities requiring overnight stay or they could not arrange for an adult to stay with them for the night after the surgery. Only 6% of the planned outpatients had unplanned admittance for an overnight stay. This demonstrates that pain and nausea can be treated effectively, and patients can be discharged the same day. The main reason for unplanned admittance was hematoma. However, the emergence of hematoma was equal in both groups. In addition, the rate of readmissions was low in both groups. Interestingly, patients seem to manage as well with the postoperative condition (e.g., nausea and pain) at home as they do in hospital. Inpatients had co-morbidities more often than outpatients. This is understandable as an underlying medical condition is one of the main reasons a patient

**Table 4** Costs in euros (€) of the breast reduction operations (matched N = 202).

	Day surgery (n = 101)			Inpatient reduction mammoplasty (n = 101)			P
	n	Md	(Range)	n	Md	(Range)	
Planned costs, Md (Range)	101	2990€	(2990€–2990€)	101	3923€	(3923€–3923€)	<0.001
Costs of late corrective operations, Md (Range)	6	2036€	(2036€–2036€)	9	2036€	(2036€–2036€)	1.000
Cared patients	101	0€	(0€–2036€)	101	0€	(0€–2036€)	0.422
Expenses after re-admission, Md (Range)	4	3923€	(3923€–4466€)	3	3923€	(3923€–3923€)	0.629
Cared patients	101	0€	(0€–4466€)	101	0\$	(0\$–3923€)	0.693
All patients							
Wound care clinic, Md (Range)	20	269€	(179€–1253€)	56	179€	(179€–716€)	0.093
Cared patients	101	0€	(0€–1253€)	101	179€	(0€–716€)	<0.001
All patients							
Emergency department, Md (Range)	11	170€	(170€–170€)	11	170€	(170€–340€)	0.478
Cared patients	101	0€	(0€–170€)	101	0€	(0€–340€)	0.961
All patients							
Total costs, Md (Range)	101	2990€	(2990€–7805€)	101	4102€	(3923€–8374€)	<0.001

Differences between patient groups were tested using Mann-Whitney test.

may require a planned overnight stay in hospital. When conducting reduction mammoplasty, our upper limit for BMI is 30. Therefore, we operate overweight but not obese patients. The follow-up time was shorter in outpatients than in inpatients due to the study setting. However, the events studied here are events that occurred near to the primary surgery and well within even the shortest follow-up time in both groups. Only late corrective operations might take place later than the follow-up time in the outpatient group.

The need to reduce healthcare costs and free up hospital beds for those patients who would benefit from overnight care is clear. However, the leading factor that must be considered in the transformation to ambulatory patient care in major surgical procedures is patient safety. We need, therefore, to re-examine our practices and ensure that the rate of complications after reduction mammoplasties performed in an outpatient setting are comparable to the same procedures performed in an inpatient setting. Concerns have been raised that infection rates, for example, would be higher after outpatient surgeries, but the data seem to suggest the opposite.<sup>9</sup> We used the Clavien-Dindo classification to categorize complications. The occurrence of all complications seemed to be slightly lower in outpatients than in inpatients. Some complications may, however, be underdiagnosed due to patients not reporting them after their discharge from hospital, though this possibility exists in both groups. Same day discharge did not lead to an increase in the number of contacts to the healthcare system or urgently performed surgeries (e.g., hematoma or infection). The costs were calculated for both the primary surgical procedure and also for any possible indirect costs. The costs of reduction mammoplasty surgery performed in an outpatient setting are less than for inpatient procedures. Even when any possible additional costs are considered, the costs of surgery performed in an outpatient setting make it a significantly more cost-effective way to perform reduction mammoplasties. Furthermore, according to our results, patient safety is not compromised in outpatients compared to patients treated in an inpatient setting.

## Conclusions

We conclude that reduction mammoplasties can be safely conducted as outpatient procedures. The emergence of complications in outpatients who undergo surgery is comparable to that of surgery performed in an inpatient setting. Moreover, those patients who undergo surgery in an outpatient setting are not in contact with the healthcare system after discharge more often than those patients who stay in hospital overnight. Readmissions are rare in both groups. Not only are the immediate costs of primary surgery lower in the outpatient setting, but when the costs of any possible complications and extra contacts with the healthcare system are considered, significant savings still remain.

## Ethical approval

Not required.

## Declaration of Competing Interest

None declared.

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