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ORIGINAL ARTICLE BREAST SURGERY

Secondary Breast Augmentation: Is There a Trend for Bigger Implants?

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Abstract

Background Despite novel assessment tools and 3D simulation, patient's desire for implant size change is one of the most common reasons for revision surgery after primary breast augmentation. In this study, we analysed outcomes and predictive indicators for revision surgeries in a cohort of patients operated on by a single surgeon.

Patients and Methods All consecutive patients who underwent revision augmentation surgery between 2013 and 2017 by the first author were included in this study. Besides review of medical records, subgroups based on the indication for revision surgery were compared and statistically analysed.

Results A total of 110 patients were included in this study. Revision surgery was performed 97.2 months on average after primary augmentation. Eighty-six per cent of patients received larger implants. Indications for revision surgery and associated subgroups were: (1) wish for bigger implants (38%), (2) complication + wish for bigger implants (26%), (3) complication (29%), (4) complication + wish for smaller implants (3%) and (5) wish for smaller implants (3%). Subgroup analysis showed that patients who underwent revision surgery for bigger implants were significantly younger compared to patients who suffered a complication or desired smaller implants. Time to secondary augmentation was significantly shorter in case of wish for size change compared to complications as reason for revision surgery. Implant sizes differed significantly in patients where volume change was the sole indication for surgery compared to revisions performed due to complications.

Conclusion In our cohort of patients, almost all patients who underwent revision surgery after primary breast augmentation received bigger implants. Patients who specifically wished for size change were younger, asked for surgery earlier and received larger volumes compared to patients who underwent revision surgery for other reasons.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Breast augmentation · Breast implantation · Secondary breast augmentation · Complications

Introduction

According to the American Society of Plastic Surgeons, breast augmentation is the most common cosmetic surgical procedure in the field of plastic surgery [1]. Thanks to improvements in operation techniques and implant materials, the rate of complications decreased over the last decades [2]. However, recent studies revealed that the incidence of reoperation requiring explantation of the silicone device is still as high as 9.2% within the first 10 years after primary augmentation [3]. This is mainly attributed to patient's wish for size change, accounting for more than 30% of these cases and being the most common

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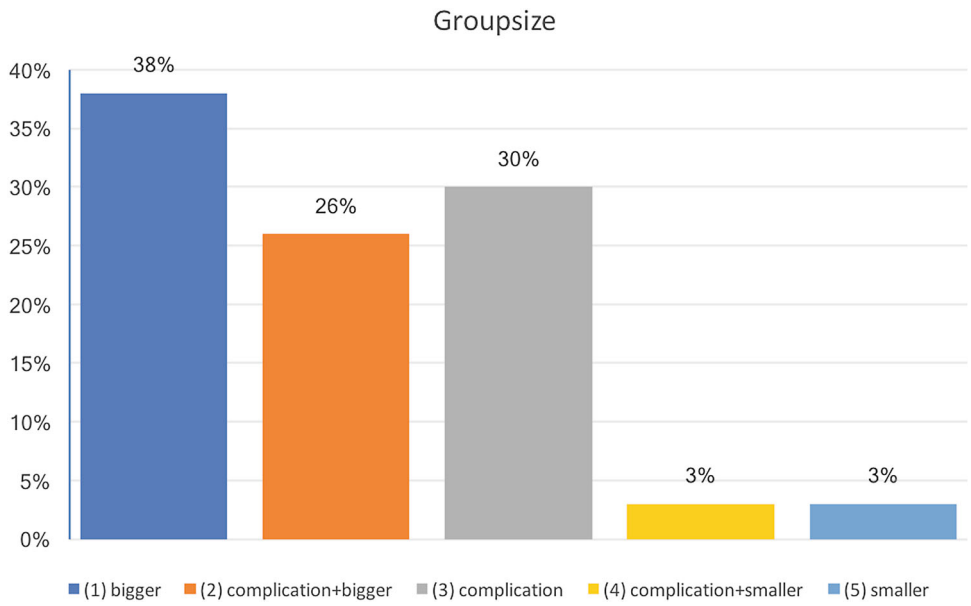

Fig. 1 Group size; *y*-axis: number of patients in percentage; *x*-axis: groups

indication for reoperation in the early stage after primary breast augmentation [3]. Interestingly, this significant percentage of patients demanding size change has remained stable despite improved planning methods and better patient education, including the introduction of computer 3D simulation [4]. The question is if or when this should be seen as a complication, due to either unrealistic patients' expectations, not detected during the consultation, or to an error in the choice of the implant from the surgeon's side. Or perhaps, rather to a natural change of body shapes because of pregnancies and ageing. Or simply because of a change in the patient's preferences over time.

Although the nature of reconsideration is complex and most likely unpredictable, there might be some patient-related recurring features, associated with an increased risk for wish for different breast size after primary breast augmentation.

The aim of this study was to take a closer look at this cohort of patients undergoing secondary breast augmentation and thereby find characteristics and predictive values that could help improve decision-making in clinical practice.

Methods

All consecutive patients who underwent secondary breast augmentation between 2013 and 2017, by a single surgeon (P.M.), at our institution were included in this study. All operations were performed via an inframammary fold approach under general anaesthesia. Patients were counselled in accordance with the Declaration of Helsinki guidelines, and written informed consent was obtained preoperatively. Patient's age, indication for revision surgery, date of primary augmentation, implant size, type of implant and operative technique were reviewed retrospectively. Subgroups were divided based on the indications for revision surgery, namely (1) wish for bigger implants, (2) complication + wish for bigger implants, (3) complication, (4) complication + wish for smaller implants and (5) wish for smaller implants (Fig. 1).

Differences between outcome measures were statistically analysed by means of the independent samples *t*-test. The level of statistical significance was set as $p < 0.05$. All results were given as means and standard deviations.

Results

Between 2013 and 2017, a cohort of 110 patients were operated on by the first author (P.M.) for secondary breast augmentation. Patients' age was 37.9 years on average. The time span between primary and secondary operations varied from 6 months to 30 years with a mean of 97.2 months. Only for one patient the date of primary implantation was unknown. The primarily implanted implants had a volume ranging between 200 cc and a maximum of 750 cc with a mean of 343.8 cc. The secondary implanted devices had a volume between 185 cc and 1050 cc with a mean of 426.0 cc. A total of 67 patients (60.9%) had received anatomically shaped implants during their primary breast augmentation, and 43 (39.1%) had instead round implants. The implant surface was textured in 75 patients (68.2%) and smooth in 35 patients (31.8%). The implants of primary augmentation were gel-filled in 91 patients (82.7%) and saline-filled in 19 patients (17.3%).

Table 1 Epidemiologic and outcome data of all patients

	Patient age (years)	Time in between surgeries (months)	Previous implant volume (cc)	New implant volume (cc)	Volume difference (cc)	Bigger volume	Same volume	Smaller volume	Combined lift
All patients $n = 110$									
Mean	37.9	97.2	343.8	426.0	123.1	86.4% ($n = 95$)	3.6% ($n = 4$)	10.0% ($n = 11$)	17.3%
SD	10.2	79.2	86.7	120.7	116.9				

SD—standard deviation

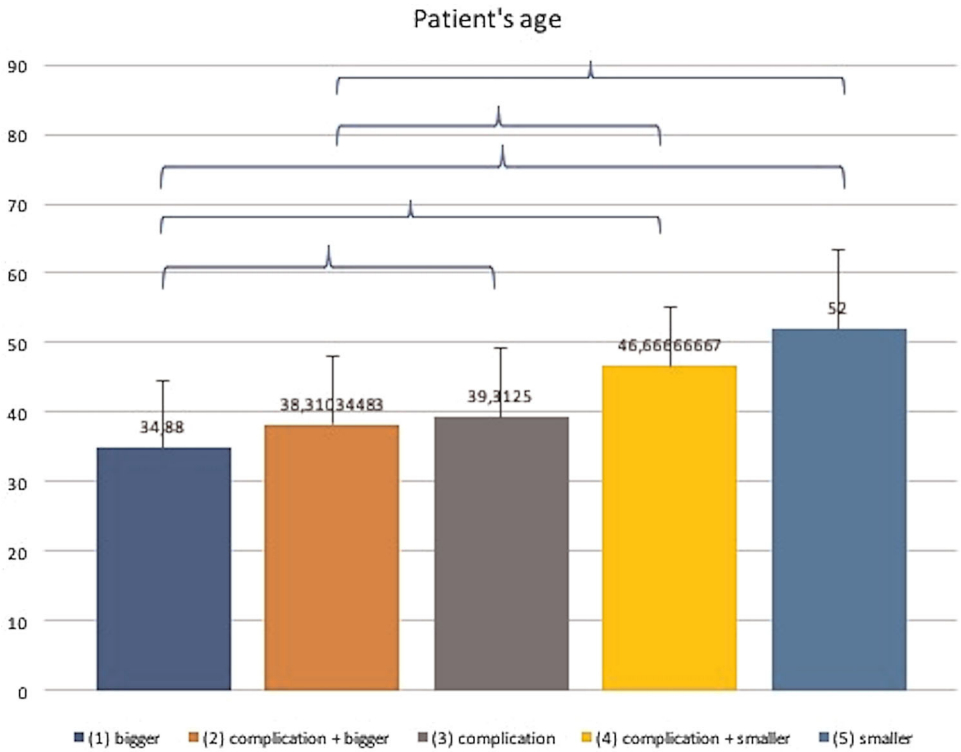

Fig. 2 Patient's age; *y*-axis: age in years; *x*-axis: groups

For their secondary augmentation, 93 patients received round implants (84.5%) and 17 patients anatomically shaped implants (15.5%). All devices inserted during secondary augmentation were textured and gel-filled ($n = 110$; 100%).

A total of 106 patients had the implant positioned submuscular during their primary augmentation, and four patients had received a subglandular placement (96.4% submuscular vs. 3.6% subglandular). In case of submuscular placement, secondary breast augmentation involved the creation of a neo-submuscular pocket according to the technique described by Montemurro et al. [5]. In the four cases of initial subglandular implant positioning, the implant plane was changed to submuscular.

Of these 110 patients, 86.4% ($n = 95$ patients) received new implants with bigger volumes and 10.0% ($n = 11$ patients) a smaller volume. The remaining 3.6% ($n = 4$ patients) received the same implant size. Some patients (17.3%) underwent implant change combined with breast lift (Table 1). A total of 15 women (13.6%) became pregnant between their primary and secondary augmentations. No cases of major weight changes were reported in our cohort of patients.

Indication for revision surgery was wish for bigger implants in 38% (Group 1, $n = 42$) of cases, complication and wish for bigger implants in 26% (Group 2, $n = 29$), complication alone in 30% (Group 3, $n = 33$), complication and wish for smaller implants in 3% (Group 4, $n = 3$) and sole wish for smaller implants in 3% of cases (Group 5, $n = 3$). Subgroup analysis revealed that patients who underwent revision surgery with desire for bigger implants (Group 1: mean 34.8 years, $\pm$ 9.8 and Group 2: mean 38.3 years $\pm$ 9.8) were significantly younger compared to patients whose indication for revision surgery was a

Table 2 Epidemiologic and outcome data of subgroups

Subgroups		Patient age (years)	Time in between surgeries (months)	Previous implant volume (cc)	New implant volume (cc)	Volume difference (cc)	Bigger volume (%)	Same volume (%)	Smaller volume (%)	Combined lift (%)
1-Bigger only n = 42 (38%)	Mean	34.9	48.5	350.6	498.3	150.9	100.0	0.0	0.0	2.4
	SD	9.8	63.3	88.8	131.0	58.1				
2-Bigger + complication *n* = 29 (26%)	Mean	38.3	125.3	333.0	439.3	120.2	100.0	0.0	0.0	10.3
	SD	9.8	82.1	75.6	77.2	48.0				
3-Complication only *n* = 33 (30%)	Mean	39.3	128.5	332.1	347.8	33.3	71.9	12.5	15.6	34.4
	SD	10.1	70.1	70.4	64.9	27.9				
4-Smaller + complication *n* = 3 (3%)	Mean	46.7	180.0	333.3	258.3	75.0	0.0	0.0	100.0	66.7
	SD	8.6	12.0	137.7	80.8	57.7				
5-Smaller only *n* = 3 (3%)	Mean	52.0	92.0	436.7	303.3	133.3	0.0	0.0	100.0	66.7
	SD	11.5	38.6	99.3	103.0	5.8				

Subgroups		Previous implant surface		New implant surface		Previous Implant shape		New Implant shape		Previous Implant filling		New Implant filling		Previous Implant position		New Implant position	
		T (%)	S (%)	T (%)	S (%)	A (%)	R (%)	A (%)	R (%)	G (%)	SA (%)	G (%)	SA (%)	SM (%)	SG (%)	SM(%)	SG(%)
1-Bigger only n = 42 (38%)	Mean	90.5	9.5	100	0	76.2	23.8	4.8	95.2	92.9	7.1	100	0	95.2	4.8	100	0
	SD																
2-Bigger + complication *n* = 29 (26%)	Mean	55.2	44.8	100	0	55.2	44.8	10.3	89.7	65.5	44.5	100	0	100	0	100	0
	SD																
3-Complication only *n* = 33 (30%)	Mean	51.5	48.5	100	0	51.5	48.5	33.3	66.7	60.6	39.4	100	0	93.9	6.1	100	0
	SD																
4-Smaller + complication *n* = 3 (3%)	Mean	66.7	33.3	100	0	0	100	0	100	0	100	100	0	100	0	100	0
	SD																
5-Smaller only *n* = 3 (3%)	Mean	66.7	33.3	100	0	66.7	33.3	33.3	66.7	100	0	100	0	100	0	100	0
	SD																

SD—standard deviation, *s*—smooth, *t*— textured, *r*—round, *a*—anatomical, *sa*—saline, *g*—gel, *sg*—subglandular, *sm*—submascular

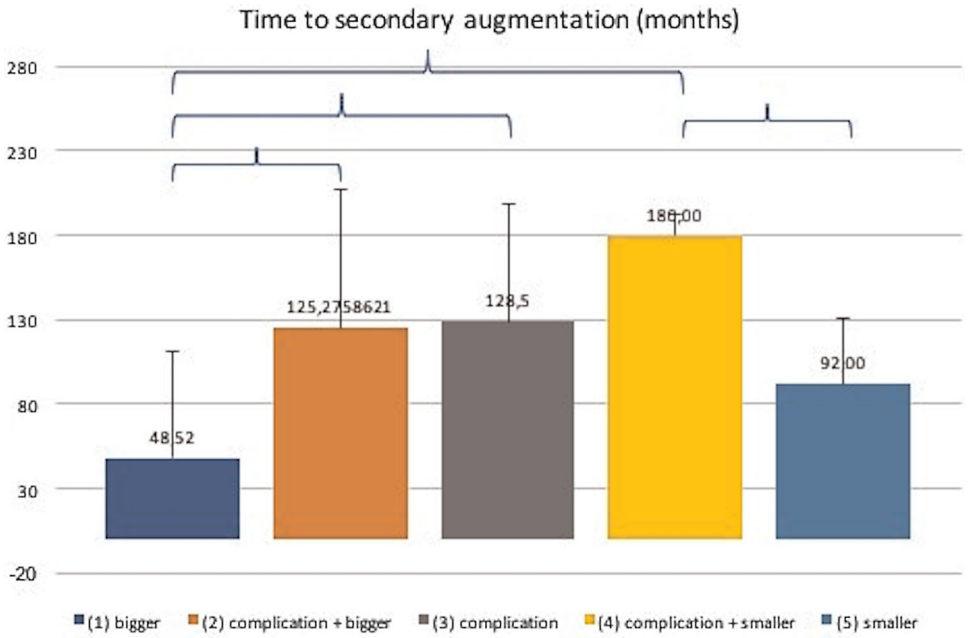

Fig. 3 Time to secondary augmentation; *y*-axis: time in months; *x*-axis: groups

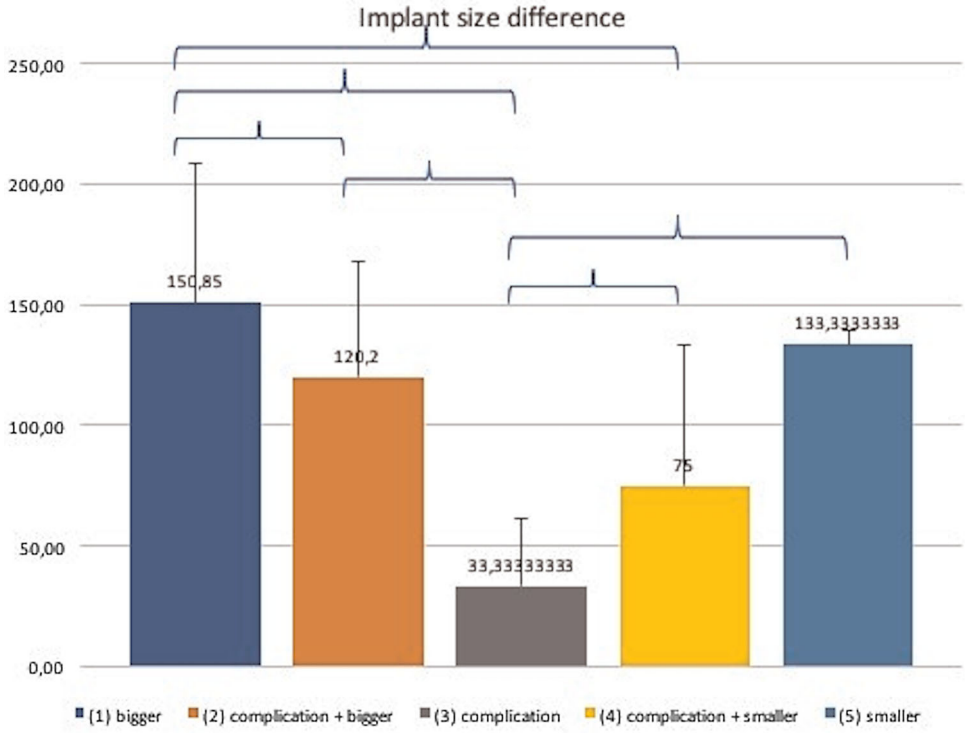

Fig. 4 Implant size difference; *y*-axis: size difference in cc; *x*-axis: groups

complication alone (Group 3: mean 39.3 ± 10; Group 1 vs. Group 3: $p = 0.03$) or went for a smaller implant size (Group 4: mean 46.7 years ± 8.6; Group 1 vs. Group 4: $p = 0.024$; and Group 5: mean 52 years ± 11.5; Group 1 vs. Group 5: $p = 0.003$) (Fig. 2 and Table 2).

Furthermore, time between primary and secondary augmentations was significantly shorter for patients who only wished for bigger implants (Group 1: mean 48.5 months ± 63) compared to groups in which complications were the only or the co-reason for revision surgery (Group 2: mean 125.3 months ± 82; Group 1 vs. Group 2: $p = 0.0001$; Group 3: mean 128.5 months ± 70; Group 1 vs. Group 3: $p = 0.0001$; and Group 4: mean 180 months ± 12; Group 1 vs. Group 4: $p = 0.0005$). For patients who only wished for smaller implants (Group 5: 92 months ± 39), time to secondary augmentation was significantly

Table 3 Epidemiologic and outcome data of all patients with complications

	Patient Age (years)	Time in between surgeries (months)	Previous implant (ccm)	New implant (ccm)	Implant difference (ccm)	Bigger volume (%)	Same volume (%)	Smaller volume (%)	Capsular contracture (%)	Double bubble (%)	Rippling (%)	Rupture (%)	Bottoming out (%)	PIP (%)	Rotation (%)	Seroma (%)	Combined lift (%)
Patients with complications $n = 65$ (59%)																	
Mean	39.1	128.9	332.6	384.9	113.7	81.5	6.2	12.3	41.5	27.7	7.7	9.2	9.2	7.7	12.3	1.5	24.6
SD	9.8	74.0	74.6	87.4	128.6												

SD—standard deviation

shorter compared to the group in which revision surgery was indicated due to complications and wish for smaller implants (Group 4: mean 180 months ± 12; Group 4 vs. Group 5: $p = 0.01$). Results are depicted in Fig. 3 and Table 2.

The increase of implant volume between primary and secondary surgeries was significantly higher in groups in which size change was the sole reason for secondary augmentation (Group 1: mean 150.8 cc ± 58; and Group 5: mean 133.3 cc ± 6) compared to groups in which complications were the only or the co-reason for revision surgery (Group 2: mean 120.2 cc ± 48; Group 1 vs. Group 2: $p = 0.02$; Group 5 vs. Group 2: $p = 0.04$; Group 3: mean 33.3 cc ± 28; Group 1 vs. Group 3: $p = 0.0001$; Group 5 vs. Group 3: $p = 0.0001$; and Group 4: mean 75 cc ± 58; Group 1 vs. Group 4: $p = 0.02$; Group 5 vs. Group 4: $p = 0.04$). Furthermore, in cases in which complications were the only reason for revision surgery (Group 3: mean 33.3 cc ± 28), the increase of implant volume was significantly smaller compared to all other groups (Group 3 vs. Group 1: $p = 0.0001$; Group 3 vs. Group 2: $p = 0.0001$; Group 3 vs. Group 4: $p = 0.0001$; Group 3 vs. Group 5: $p = 0.0001$). Implant size differences between groups are shown in Fig. 4 and Table 2.

Of all complications that led to secondary surgery (Groups 2, 3 and 4), capsular contracture had occurred in 41.5% of patients, double bubble in 27.7%, rotation in 12.3%, bottoming out in 9.2%, rupture in 9.2%, rippling in 7.7%, PIP prosthesis in 7.7% and seroma in 1.5% of cases. Data are depicted in Table 3. Additional analysis of association between previous implant characteristics (position, shape, surface and filling) and the occurrence of complications is shown in Table 4. Clinical examples are shown in Figs. 5, 6, 7, 8 and 9.

Discussion

In this study, which includes a pretty large cohort of consecutive patients operated on by a single surgeon, we found that 86% of patients who underwent secondary breast augmentation for any reason, received implants with a bigger volume, whereas 38% underwent revision surgery because they wanted bigger implants alone, and 26% suffered from an additional complication. The remaining 22% received higher volumes due to technical aspects and did not ask specifically for larger implants (i.e. the surgeon decided that a larger implant was needed to obtain the best possible result). In contrast, only 4% and 10% of patients, respectively, received the same or smaller implants during secondary breast augmentation. Interestingly, patients who wished for increased breast volume were significantly younger compared to patients who were indifferent

Table 4 Distribution of complications among study patients

Patients with complications $n = 65$ (59%)	Previous implant surface		New implant surface		Previous implant shape		New implant shape		Previous implant filling		New implant filling		Previous implant position		New implant position	
	S (%)	T (%)	S (%)	T (%)	R (%)	A (%)	R (%)	A (%)	SA (%)	G (%)	SA (%)	G (%)	SG (%)	SM (%)	SG (%)	SM (%)
Capsular contracture $n = 27$ (41.5%)	48	52	0	100	52	48	78	22	26	74	0	100	7	93	0	100
Double bubble $n = 18$ (27.7%)	72	28	0	100	78	22	61	39	83	17	0	100	0	100	0	100
Rippling $n = 5$ (7.7%)	100	0	0	100	80	20	100	0	20	80	0	100	17	83	0	100
Rupture $n = 6$ (9.2%)	17	83	0	100	33	67	100	0	17	83	0	100	17	83	0	100
Bottoming out $n = 6$ (9.2%)	33	67	0	100	50	50	83	17	50	50	0	100	0	100	0	100
PIP $n = 5$ (7.7%)	60	40	0	100	80	20	60	40	80	20	0	100	0	100	0	100
Rotation $n = 8$ (12.3%)	0	100	0	100	0	100	100	0	0	100	0	100	0	100	0	100
Seroma $n = 1$ (1.5%)	0	100	0	100	0	100	100	0	0	100	0	100	0	100	0	100

S—smooth, *t*—textured, *r*—round, *a*—anatomical, *sa*—saline, *g*—gel, *sg*—subglandular, *sm*—submascular

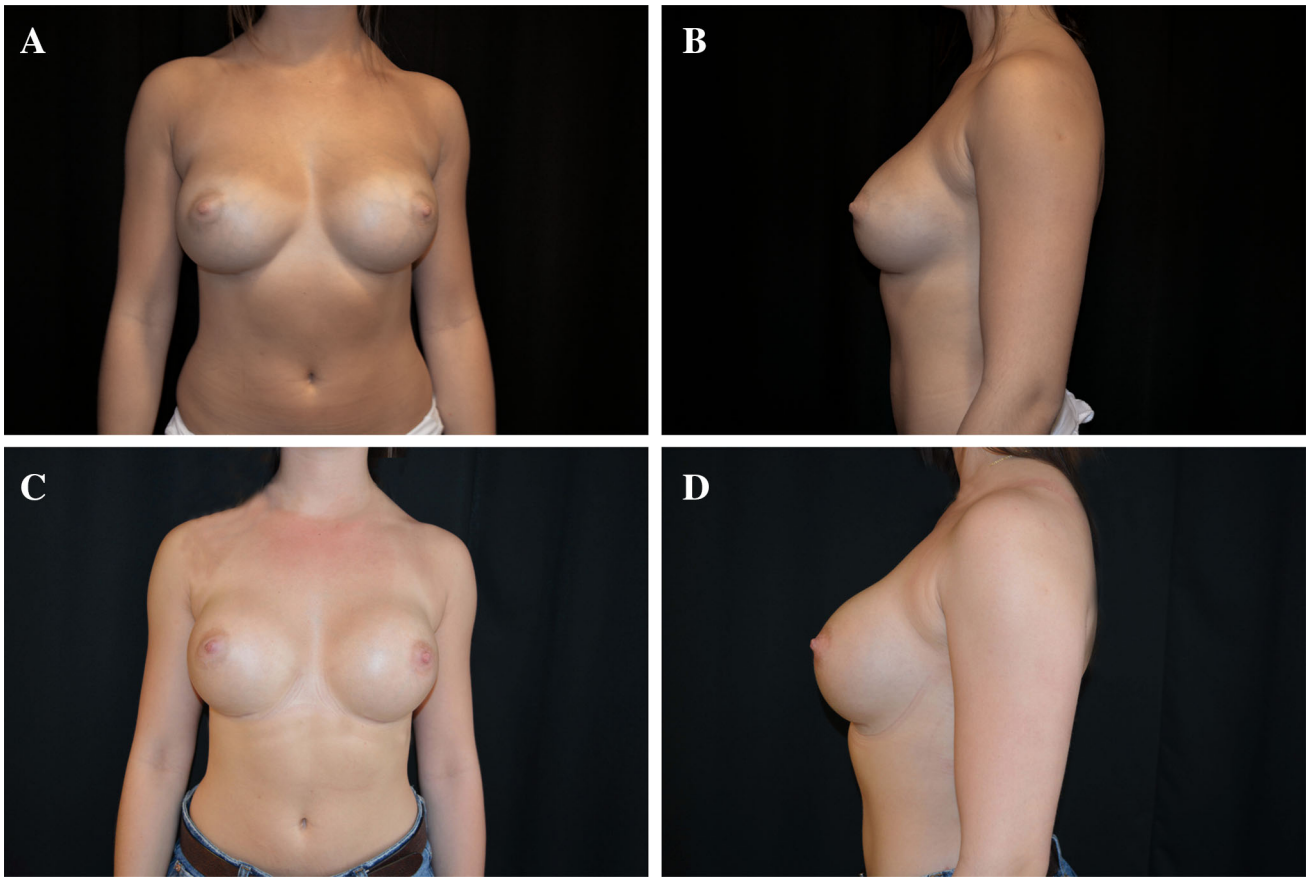

Fig. 5 **a**, **b** This 26-year-old woman presented 44 months after breast augmentation with anatomical implants, 295 cc. Breasts are soft, well positioned and symmetrical, there is no indication for surgery. Her desire is to have a larger volume. **c**, **d** Appearance at 13 months postoperatively after implant change to round 420 cc into a neo-submuscular pocket

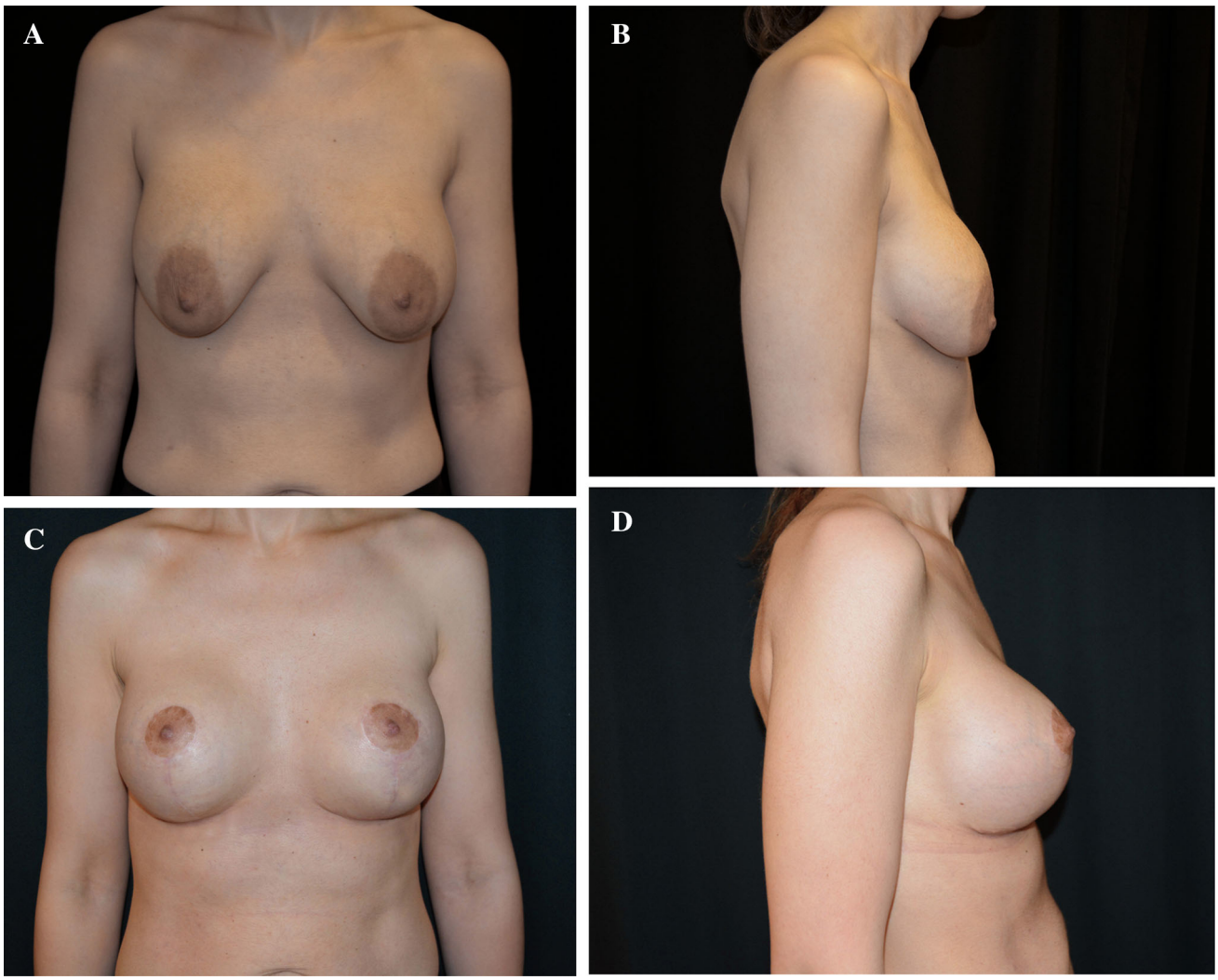

Fig. 6 **a**, **b** A 34-year-old woman with a history of breast augmentation performed 62 months earlier with round implants, 210 cc. Bilateral capsular contracture Baker III, desire for improvement in shape and wish for a larger volume are the reasons the patient decided to undergo secondary surgery. **c**, **d** Pictures at 12 months show result after implant change to round 345 cc into a neo-submuscular pocket with simultaneous pexy

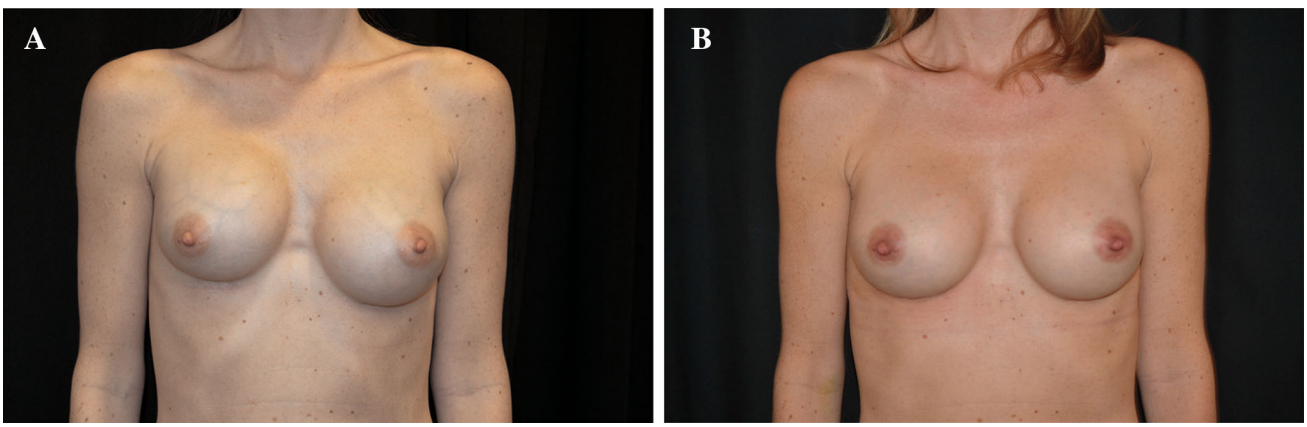

Fig. 7 **a** This 38-year-old woman presented 88 months after breast augmentation. Capsular contracture Baker III is detected on her right breast, being the sole indication for secondary surgery. **b** Appearance at 12 months postoperatively after implant change of the same volume and brand into a neo-submuscular pocket

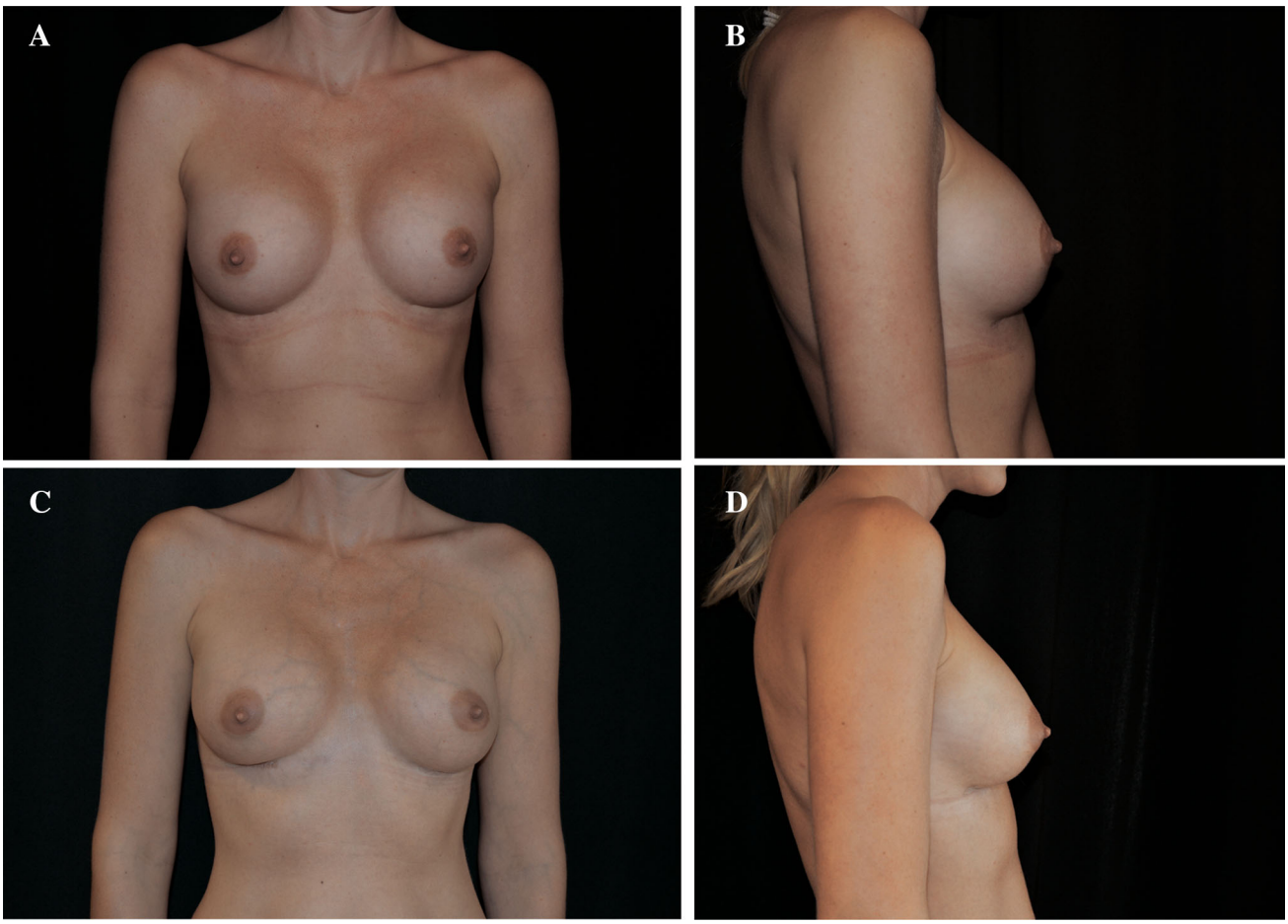

Fig. 8 **a**, **b** A 45-year-old woman, 182 months after breast augmentation with round implants, 310 cc. Capsular contracture Baker III is detected on her left breast and the patient desired a slight decrease of the size of her implants. **c**, **d** Pictures 14 months after the procedure, an implant change is performed with anatomical implants 295 cc into a neo-submuscular pocket

regarding size change or went for smaller implants ($p < 0.05$). Furthermore, irrespective of implant volume, patients who wished for size change underwent revision surgery significantly earlier ($p < 0.05$) and the increase of implant volume between primary and secondary surgeries was significantly higher in groups in which size change was the sole reason for secondary augmentation ($p < 0.05$).

Secondary breast augmentation is a difficult area for both patient and surgeon. Manufacturer's data show that the incidence of reoperation after primary breast augmentation is 18.1% to 19.4% at 6 years [6, 7] and 29.7% at 10 years [8]. Most common reasons for reoperations are complications, such as capsular contracture or malposition, and patient's desire for a change in size.

According to a survey from Hidalgo and Sinno [9], capsular contracture was found to be the most frequent reason for reoperation followed by size change. Our findings are, however, not in line with these data, showing size change before capsular contracture as the primary indication for revision augmentation. This is indeed a surprising finding. Novel biodimensional planning methods, which also include the use of three-dimensional cameras and implant simulation software, are already widely applied. This should help to better estimate patients' expectations and thus theoretically decrease the number of those who are not happy about their breast size after surgery. Nevertheless, in our patient cohort we could not tell how implant volume was measured and chosen in the first place as patients included in this study received primary augmentation at a different institution. Is it the society we live in that brings a determined idea of beauty that influences patients? Or is it simply because patients think they might be more confident in their social life with bigger breasts? Are they insecure? Or do they have a friend who did her breasts bigger and they are just trying to imitate? Or perhaps did we, as surgeons, fail to understand the patient's wishes and chose the wrong size in first place?

In general, nowadays, there is high satisfaction with postoperative results due to extensive preoperative planning [10]. There are different methods to support patients

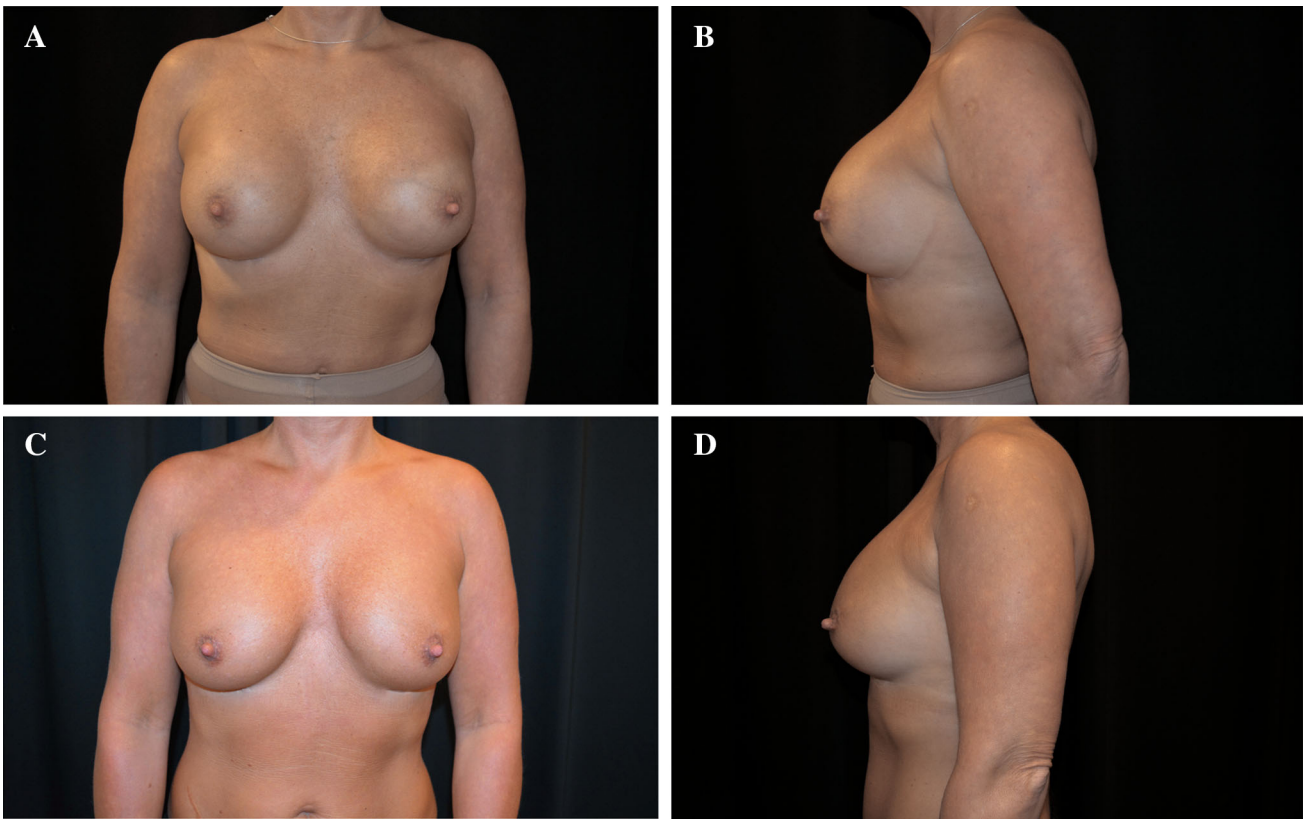

Fig. 9 **a**, **b** This 56-year-old woman presented 102 months after breast augmentation with round implants, 420 cc. Breasts are well positioned with no signs of capsular contracture, a request for a smaller size is therefore the sole indication for secondary surgery. **c**, **d** Appearance at 13 months postoperatively after implant change into a neo-submuscular pocket with round implants, 295 cc

in their decision process and preparing them for the expected results [11, 12]. In a study of Brown, the most common fear expressed by patients considering breast augmentation was that the breast would appear too big afterwards. Surprisingly, 12 weeks after surgery, only 3.7% desired to change for smaller, whereas 19.4% were even willing to go for bigger implants [9]. The authors discussed postoperative swelling as a reason for patient's subsequent wish for larger implants. Indeed, swelling can make the augmented breast firmer and up to one cup size bigger compared to the definitive result and thus influence patient's perception and body image [13].

Although our study substantiated that there might be a trend for bigger implants, way more patients requested an increase of implant size compared to Brown's study. Of all subjects undergoing revision surgery, only 6% asked for smaller and 64% requested larger implants. The main difference to Brown's study is the time that passed between primary and secondary surgeries, which was much longer in our study, with 97.2 months on average. Although patients who desired only a size change underwent reoperation significantly earlier compared to patients who needed revision surgeries due to complications, time to reoperation for size change was still 48 months on average and thus way longer than Brown's follow-up period of 12 weeks. Therefore, we believe that besides swelling in the early phase after breast augmentation, something else influences the patient in the long run.

Interestingly, age of the patient did not correlate with wish for size change in Brown's study [10]. In contrast, we found that patients who desired bigger implants were significantly younger compared to both patients who underwent revision surgery for complications and patients who requested smaller implants. This indicates that wish for size change might in some cases depend on a "physiological" process of growth and change that a person normally undergoes with age, therefore not predictable nor avoidable. If this was true, it might not be hazardous to say that despite all the efforts in understanding patient's desires during the consultation, surgeons will still have some patients who desire a bigger implant after breast augmentation.

Results of this study are limited by unknown data about primary augmentations. Previous surgeries were performed at different institutions, and information about consultation and preoperative assessment for the choice of implant size were not available. In this context, we also do not know what percentage of primary augmentations underwent

revision surgeries, which would obviously be a very important aspect.

Although this limitation does not allow determination of very interesting data, it is reality in clinical practice that patients often do not consult the same surgeon if not satisfied with the result of their first operation. Therefore, we believe that our data very well depicted a large cohort of patients who underwent revision surgery in a single institution and operated by one single surgeon.

Conclusion

In summary, our study shows that patients requesting size change do desire bigger breasts, are of young age and undergo revision surgery early after primary augmentation, compared to those who undergo revision surgery for other reasons.

Almost all patients (86%) of our cohort, who underwent revision surgery after primary breast augmentation, received larger implants. Wish for bigger implants was the most common reason for revision surgery followed by complications and wish for smaller implants. Patients who desired bigger implants were younger and consulted their surgeon earlier compared to patients who received new implants for other indications. Furthermore, patients who wished for size change only received significantly larger volumes compared to patients who received bigger implants due to technical aspects.

These findings may describe a trend, a generation of patients coined by a consumer society, rapidly changing their mind and tastes. This requires new and extraordinary communication skills from the surgeon side, who needs to be able to understand and deal with this new generation of patients, created by a restless society.

Compliance with ethical standards

Conflict of interest Dr. Montemurro is a consultant and speaker for Allergan, Inc. (Irvine, Calif.). Dr. Fischer has no disclosures. Dr. Hager has no disclosures. Dr. Hedén is a consultant and speaker for Allergan, Inc. (Irvine, Calif.) and an unpaid consultant for Canfield Scientific (Fairfield, N.J.).

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