



Original article

Long-Term Satisfaction of Reduction Mammoplasty for Bilateral Symptomatic Macromastia in Younger Patients

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 A B S T R A C T

Purpose: There is controversy about performing reduction mammoplasty in younger patients. Although no studies show poor surgical outcomes, a paucity of data exists on long-term outcomes and satisfaction.

Methods: A single center mixed-mode mail and telephone surveyed 203 women who underwent reduction mammoplasty for symptomatic macromastia between 1985 and 2005, who were <21 years of age at surgery. A total of 99 women responded (48.8%).

Results: Mean operative patient age was 19.1 years (range, 16.2–20.9 years). Mean follow-up was 15.6 years (range, 6.0–26.4 years). Sustained long-term symptom resolution was highest with shoulder pain (94.7%), breast pain (92.0%), and intertrigo (88.6%). Improvements in feeling uncomfortable (87.5%), finding clothes that fit (86.0%), sports participation (85.2%), and running (83.7%) were reported. Patients reported self-perceived decreased nipple sensitivity (67.2%) and difficulties breast-feeding (65.2%). Prominent incisional scarring was reported by 71.7%; however, 56.5% reported that scarring had not affected them in any way. The majority (93.9%) rated the overall success of their operation as at least 50% successful; 42.4% reported 100% success in treating the problems. Improved quality of life was reported by 88.7%. Most respondents (66.7%) would definitely recommend this procedure to a friend or family member at the same age. Knowing what they know now, 95.9% would choose to have the surgery again. Subgroup analysis of patients <18 years of age ($n = 23$; mean age, 17.3 years) at the time of surgery revealed equivalent results.

Conclusions: Long-term follow-up of reduction mammoplasty in patients aged 16–20 years shows good overall satisfaction and improvements in quality of life.

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**IMPLICATIONS AND
CONTRIBUTION**

Patients undergoing breast reduction for bilateral macromastia experience excellent symptom and musculoskeletal improvements. Limited long-term data exist on younger patients undergoing this procedure. This study shows that younger females (<21 years of age) undergoing breast reduction experience good overall satisfaction and improvement in quality of life that continue into adulthood.

Symptomatic macromastia or mammary hypertrophy is defined as excessive breast tissue causing a constellation of symptoms including chronic breast pain, intertrigo, upper back, neck and shoulder pain, backache, acquired thoracic kyphosis,

shoulder grooving from bra straps, upper extremity paresthesias, and headaches [1]. Symptomatic relief and long-term satisfaction after bilateral reduction mammoplasty for symptomatic macromastia in the general population is well documented in the literature [1–6]. In 2010, over 138,000 breast reductions were performed; approximately 3,900 of these procedures (2.8%) were performed on individuals younger than 18 years of age [7]. It has also been reported that 80% of women with macromastia have symptomatology that originated during puberty [8]. Controversy about reduction mammoplasty on individuals <21 years old

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(including adolescents) has led to a general sense of caution when performing this procedure in these age groups [8–12]. Thus, the importance of this procedure in this age group should not be overlooked. Although no studies exist showing poor surgical outcomes in this population, there is a paucity of data on long-term postoperative outcomes and satisfaction in younger females undergoing reduction mammoplasty.

Methods

We performed a 20-year retrospective case review from January 1, 1985, to December 31, 2005, using International Classification of Diseases codes and the Rochester Epidemiology Project [13]. Incident cases were defined as female patients <21 years of age who underwent reduction mammoplasty for symptomatic bilateral macromastia in Olmsted County, Minnesota, during the defined period.

Over the 20-year period, 214 patients met inclusion criteria. On further review, we excluded 11 patients (nine because of different surgery and two who had died). From May 18, 2011, through July 18, 2011, we performed a mixed-mode mail and telephone survey of the 203 eligible patients; 99 responded (48.8%).

The 43-item survey primarily evaluated long-term quality of life and overall satisfaction. In addition, complications, resolution of symptoms, feelings about breast size, scarring, pregnancy, breast-feeding, and breast tissue recurrence were also addressed. The survey research center mailed surveys up to three times. If no response was obtained, a follow-up phone call was attempted. Patients who were successfully contacted and completed the survey were included in the study. We also performed an additional subgroup analysis of patients <18 years of age at the time of surgery. All patients gave authorization for research. The institutional review board approved this study.

We excluded patients who underwent reduction mammoplasty for benign or malignant lesions or traumatic deformities. Also excluded were patients who received surgery for unilateral asymmetric breasts, because some of this patient population would have received a breast augmentation/mastopexy versus a unilateral reduction, and the procedure would primarily be assumed to be performed for aesthetic results of symmetry.

The Division of Biostatistics performed all analyses using statistical software SAS, version 9.1 for Windows (SAS Institute, Cary, NC). We used descriptive statistics to describe patient characteristics and responses among responders.

Results

There were 99 female patients who had undergone bilateral reduction mammoplasty under the age of 21 years for symptomatic macromastia during the defined period and had completed the follow-up survey. Overall mean age at the time of surgery was 19.1 years (median 19.2 years; range, 16.2–20.9 years). Of the 99 patients, 23 were <18 years of age at the time of surgery (mean age, 17.3 years; range, 16.2–19.9 years). Mean follow-up time from the date of surgery to closure of the study was 15.6 years (median, 15.8 years; range, 6.0–26.4 years) for all patients. A total of 15 surgeons performed an average of 6.6 operations (range, 1–22 operations). For patients <18 years of age, six surgeons performed an average of 2.9 operations (range, 1–6 operations). Table 1 summarizes patient and operative

characteristics for all patients and the subgroup of patients <18 years of age at the time of surgery.

We performed a single vascular pedicle technique on 62 patients (62.6%) and a bipediced vascular pedicle technique on 27 patients (27.3%), all of whom except one had similar incisions. For those in the subgroup of patients <18 years of age with technique specifically noted in the operative note, we performed a single pedicle technique on 13 patients and a bipedicle technique on seven. The major surgical techniques practiced during the study period are still practiced currently; no new techniques were attempted.

Patients were asked whether they recalled experiencing symptoms associated with bilateral macromastia before the surgery, and about those symptoms now, and whether they were improved or worse, or if they experienced no change. Patients reported sustained long-term improvement in shoulder pain (94.7%), breast pain (92.0%), intertrigo (88.6%), bra-strap grooving (87.5%), upper back pain (85.1%), neck pain (81.7%), lower back pain (69.6%), and headache (43.3%). In addition, we asked patients whether they recalled experiencing preoperative lifestyle problems related to macromastia; we asked about those symptoms now, and whether they were improved or worse, or if they experienced no change. Patients reported sustained long-term improvement in feeling uncomfortable because of their large breasts (87.5%), difficulty finding clothes that fit (86.0%), difficulty running (89.8%), and difficulty participating in sports (84.7%). Table 2 summarizes long-term symptom and lifestyle improvement for all patients and the subgroup of patients <18 years of age at the time of surgery.

Self-perceived decreased nipple sensitivity resulting from the operation was reported by 67.3% (n = 66). Self-perceived prominent scarring at incisions was reported by 71.7% (n = 71), and 56.5% (n = 39) responded that the scarring had not affected them in any way. In the subgroup of patients <18 years of age, self-perceived decreased nipple sensitivity was reported by 60.9% (n = 14). Self-perceived prominent scarring was reported by 65.2% (n = 15), and 46.7% (n = 7) reported that scarring had not affected them in any way.

Table 1

Patient and operative characteristics for all patients and patients less than 18 years of age at the time of surgery

Characteristic	Mean (\pm SE)	Range
Patient age at surgery (years)		
All patients (n = 99)	19.1 (\pm 1.3)	16.2–20.9
Patients <18 years of age (n = 23)	17.3 (\pm 1.2)	16.2–17.9
Time from surgery to follow-up (years)		
All patients (n = 99)	15.6 (\pm 5.8)	6.0–26.4
Patients <18 years of age (n = 23)	15.0 (\pm 1.11)	8.3–15.9
Body mass index (kg/m ²)		
All patients (n = 84)	27.2 (\pm 4.6)	18.6–38.5
Patients <18 years of age (n = 19)	27.6 (\pm 9.6)	18.6–35.1
Weight of breast tissue resected (g)		
All patients (n = 99)		
Right breast	626.4 (\pm 27.5)	180–2,150
Left breast	635.7 (\pm 27.4)	150–2,095
Patients <18 years of age (n = 23)		
Right breast	669.3 (\pm 58.2)	180–1,290
Left breast	690.0 (\pm 61.1)	150–1,480
Number of operations per surgeon		
All patients (n = 99)	6.6	1–22
Patients <18 years of age (n = 23)	2.9	1–6

SE = standard error.

Table 2

Sustained long-term symptom and lifestyle improvement after reduction mammoplasty in all patients and patients less than 18 years of age at the time of surgery (%)

	Did you experience preoperatively? (Yes)	What is your experience now?		
		Improved	Worse	No Change
Symptom				
All patients				
Shoulder pain	75.8	94.7	0	5.3
Breast pain	27.1	92.0	0	8.0
Intertrigo	45.4	88.6	2.3	9.1
Bra-strap grooving	89.8	87.5	2.3	10.2
Upper back pain	74.7	85.1	0	14.9
Neck pain	61.9	81.7	3.3	15.0
Lower back pain	69.7	69.6	5.8	24.6
Headache	30.3	43.3	3.3	53.3
Patients <18 years of age				
Shoulder pain	65.2	100.0	0	0
Breast pain	34.8	100.0	0	0
Intertrigo	43.5	100.0	0	0
Bra-strap grooving	78.2	94.4	0	5.5
Upper back pain	78.2	77.7	0	22.2
Neck pain	47.8	81.8	0	18.1
Lower back pain	87.0	66.6	5.5	27.7
Headache	39.1	44.4	11.1	44.4
Lifestyle problem				
All patients				
Participating in sports	84.7	85.2	3.7	11.1
Running	89.8	83.7	2.3	13.9
Finding clothes that fit	94.9	86.0	1.1	12.9
Feeling uncomfortable	98.0	87.5	2.1	10.4
Patients <18 years of age				
Participating in sports	87.0	89.5	0	10.5
Running	87.0	89.5	0	10.5
Finding clothes that fit	100.0	90.9	0	9.1
Feeling uncomfortable	100.0	90.9	0	9.1

When asked whether patients had overall experienced recurrence of breast enlargement since surgery, 54.5% responded they had ($n = 54$). Patients were then asked to recollect how they felt about their breast size in the first week after the operation. Patients responded that they felt the breast size was definitely too small (4.0%; $n = 4$), somewhat too small (9.1%; $n = 9$), the appropriate size (78.8%; $n = 78$), somewhat too big (7.1%; $n = 7.1$), or definitely too big (1.0%; $n = 1$). When asked how they felt about the breast size now, patients responded that they felt the current breast size was definitely too small (2.0%; $n = 2$), somewhat too small (5.1%; $n = 5$), the appropriate size (55.6%; $n = 55$), somewhat too big (21.2%; $n = 21$), or definitely too big (16.2%; $n = 16$).

In the subgroup of patients <18 years of age, 60.9% ($n = 14$) reported recurrence of breast enlargement. In the first week after surgery, patients responded that they felt their breasts were the appropriate size (87.0%; $n = 20$) or somewhat too big (13.0%; $n = 3$). Currently, respondents thought their breast size was definitely too small (4.3%; $n = 1$), somewhat too small (4.3%; $n = 1$), the appropriate size (39.1%; $n = 9$), somewhat too big (34.8%; $n = 8$), or definitely too big (17.4%; $n = 4$).

Of all patients, 72 reported being pregnant since the operation (74.2%), which averaged 2.0 pregnancies (range, 1–5). Breast enlargement during pregnancy was reported by 75.0% of respondents ($n = 54$), with postpartum resolution reported by 74.5% ($n = 38$). In the subgroup of patients <18 years of age, 16 reported pregnancy since the operation (69.6%), which averaged

1.9 pregnancies (range, 1–3). Breast enlargement was reported by 68.7% ($n = 11$); of these, postpartum resolution was reported by 46.7%.

Of all pregnant patients, 23 (31.9%) reported that they breast-fed after surgery. Fifteen of these patients recalled having difficulty. Reasons cited included decreased milk production, unilateral milk production, and latching problems because of an inverted nipple. A total of 49 patients reported not breast-feeding postpartum (68.1%). In the subgroup of patients <18 years of age, only three (18.7%) reported that they breast-fed after surgery; two reported difficulty with milk production. In all patients, there were no differences between surgical technique performed and ability to breast-feed.

Four women reported undergoing an additional procedure on the breast since the surgery. One woman underwent a second breast reduction at a different institution, reportedly 1 month after the original surgery. Two women underwent scar and nipple revisions, both 3 years after the original operation. A fourth woman underwent a breast biopsy for a cyst 10 years postoperatively. No patients <18 years of age underwent additional procedures.

When asked how patients felt overall about the symptoms now, they responded that symptoms were completely gone (32.3%; $n = 31$), much better now than expected (36.5%; $n = 35$), somewhat better now than expected (16.7%; $n = 16$), now about what they expected (6.3%; $n = 6$), somewhat worse than they expected (7.3%; $n = 7$), or much worse now than they expected (1.0%; $n = 1$).

Patients were asked how successful they felt the operation had been in treating the problems. Patient responses included: completely successful with 100% of problems relieved (42.4%; $n = 42$), very successful with about $\geq 75\%$ of problems relieved (32.3%; $n = 32$), somewhat successful with about 50% of problems relieved (19.2%; $n = 19$), not very successful with <50% of problems relieved (4.0%; $n = 4$), or completely unsuccessful with no problems relieved (2.0%; $n = 2$).

Patients were asked how much the reduction mammoplasty changed the quality of their life. Patients responses included: more improvement than I ever dreamed possible (23.7%; $n = 23$), great improvement (48.5%; $n = 47$), moderate improvement (16.5%; $n = 16$), a little improvement (5.2%; $n = 5$), no change (4.1%; $n = 4$), moderately worse (1.0%; $n = 1$), or much worse than I ever dreamed possible (1.0%; $n = 1$).

Patients were asked whether they would recommend the surgery to a friend or family member who was the same age as they were when they originally underwent the surgery. Patient responses included: definitely would recommend (66.7%; $n = 66$), probably would recommend (19.2%; $n = 19$), unsure if they would recommend (7.1%; $n = 7$), probably would not recommend (3.0%; $n = 3$), and definitely would not recommend (4.0%; $n = 4$).

Finally, 95.9% of women ($n = 93$) responded that knowing what they know now, they would still undergo this surgery again. In the subgroup of patients <18 years of age at the time of surgery, 95.4% would still undergo surgery again ($n = 21$).

Table 3 summarizes reduction mammoplasty long-term follow-up questionnaire results for all patients and the subgroup of patients <18 years of age at the time of surgery.

Discussion

Over 138,000 breast reductions were performed in 2010; approximately 3,900 of these procedures (2.8%) were performed on individuals younger than 18 years [7]. It has also been

Table 3
Reduction mammoplasty long-term follow-up questionnaire results

Survey Questions and Answer Choices	Responses for All Patients (n [%])	Responses for Patients <18 Years of Age (n [%])
Overall, are your symptoms better or worse than you expected now?		
Symptoms completely gone	31 (32.3)	7 (31.8)
Much better	35 (36.5)	7 (31.8)
Somewhat better	16 (16.7)	3 (13.6)
About what I expected	6 (16.7)	4 (18.1)
Somewhat worse	7 (7.3)	1 (4.5)
Much worse	1 (1.0)	0
Total responses	96 (100.0)	22 (100.0)
Overall, how successful do you feel that your operation has been in treating the problems you had?		
Completely successful: 100% of problems relieved	42 (42.4)	7 (30.4)
Very successful: ≥75% of problems relieved	32 (32.3)	11 (47.8)
Somewhat successful: 50% of problems relieved	19 (19.2)	5 (21.7)
Not very successful: <50% of problems relieved	4 (4.0)	0
Completely unsuccessful: no problems relieved	2 (2.0)	0
Total responses	99 (100.0)	23 (100.0)
How much did the reduction mammoplasty surgery change the quality of your life?		
More improvement than I ever dreamed possible	23 (23.7)	5 (21.7)
Great improvement	47 (48.5)	12 (52.2)
Moderate improvement	16 (16.5)	4 (17.4)
A little improvement	5 (5.2)	1 (4.3)
No change	4 (4.1)	1 (4.3)
A little worse	0	0
Moderately worse	1 (1.0)	0
Much worse than I ever dreamed possible	1 (1.0)	0
Total responses	97 (100.0)	23 (100.0)
How likely would you be to recommend this surgery to a friend or family member who is the same age you were when you had the surgery?		
Definitely would recommend	66 (66.7)	17 (73.9)
Probably would recommend	19 (19.2)	4 (17.4)
Unsure	7 (7.1)	2 (8.7)
Probably would not recommend	3 (3.0)	0
Definitely would not recommend	4 (4.0)	0
Total responses	99 (100.0)	23 (100.0)
Knowing what you know now, would you do this surgery again?		
Yes	93 (95.9)	21 (95.4)
No	4 (4.1)	1 (4.5)
Total responses	97 (100.0)	22 (100.0)

reported that 80% of women with macromastia have symptomatology that originated during puberty [8]. The symptomatic relief and long-term satisfaction after bilateral reduction mammoplasty for symptomatic macromastia in the general population is well documented in the literature [1–6]. Despite excellent symptom resolution, there is controversy and reluctance by pediatricians, parents, and plastic surgeons about performing this procedure in younger women [8–12]. Even insurance companies have been found to set age restrictions on this procedure [14]. In our review, we found little literature regarding reduction mammoplasty in younger women and long-term satisfaction, and decided to study our own population.

Evans and Ryan [11] performed a follow-up study of 15 patients age ≤20 years (mean, 17.7 years) who had undergone a reduction mammoplasty, with a mean follow-up of 42 months. Although the study primarily addressed complication rates, the authors stated that all patients “were pleased with the results and would have the procedure performed again.” They concluded that reduction mammoplasty is a safe, viable surgical option for the adolescent female.

McMahan et al. [15] studied 86 patients with a mean age of 17.8 years (range, 15–19.9 years) who underwent reduction mammoplasty, and successfully observed 48 patients (56%). Mean follow-up was 5.9 years. At follow-up, 76% had relief of back pain, 78% reported relief of neck pain, 89% reported relief of shoulder strap pain, and 93% reported cessation of submammary rashes. A total of 73 reported being happy with the current breast size and 94% would have the surgery done now for the same symptoms had they not undergone surgery in the past. In addition, 94% were satisfied enough that they would recommend it to a friend with symptomatic macromastia. The authors concluded that patients under the age of 20 years undergoing reduction mammoplasty benefit in symptom relief and long-term satisfaction.

Lee et al. [10] surveyed 73 patients with a mean age of 16.1 years (range, 12.5–19.0 years), who underwent bilateral reduction mammoplasty, of which only 17 were successfully contacted (23%). A total of 82% reported resolution of preoperative symptoms. Of those surveyed, 65% reported they would repeat the adolescent surgery again and 82% would recommend reduction mammoplasty to a friend. The authors concluded that adolescent patients benefit significantly from reduction mammoplasty and that long-term satisfaction remains high, despite the patient age.

Webb et al. [16] reviewed 67 patients with a mean age of 17.1 years (range, 13.3–20.4 years) to examine outcomes of obese and nonobese adolescents who underwent reduction mammoplasty. After a mean follow-up of 34.4 weeks, 86.6% were satisfied with the results, as reported to a physician during a postoperative visit. Although obese patients had more complications ($p = .013$), there was no significant difference in self-reported satisfaction rates between obese and nonobese patients ($p = 1.00$). The authors concluded that reduction mammoplasty is well tolerated in both obese and nonobese adolescents with macromastia.

All patients should be counseled on the potential short- and long-term complications of a reduction mammoplasty, such as wound-healing problems, hypertrophic scarring, decreased nipple sensation, recurrent breast hypertrophy, nipple deformation, and inability to breast-feed [10,11,15,17]. Patients should be counseled that aging, childbearing, and weight changes may affect future breast size. It is also important to provide preoperative counseling on breast-feeding issues and difficulties that may be experienced postoperatively with this procedure, even though studies have shown no differences in breast-feeding when comparing different pedicles, women who had reductions and those who had no prior breast surgery, and the extent or amount of glandular breast tissue excised [18–21]. Specifically in an adolescent population, Aillet et al. [22] reported that adolescents undergoing reduction mammoplasty can breast-feed with a complication rate similar to that of the general population. McMahan et al. [15] reported only 13% of women who were unable to breast-feed after undergoing reduction mammoplasty as an adolescent.

Adequate preoperative education can further prepare patients for their short- and long-term postoperative experience. Sadly, Aillet et al. [22] found that a surprising 63% of adolescent patients reported they were not informed about the potential risks concerning breast-feeding. It is important to provide comprehensive detailed preoperative education to all patients. Although there is no formal position on plastic surgery in teenagers, the American Society of Plastic Surgeons has developed a position statement about surgery in teenagers, which can be found on their website [24].

There is no standardized protocol for the workup of symptomatic bilateral macromastia in the younger patient. As with any patient, a thorough history and physical is important. One aspect of the history to which we pay particular attention is a stable bra and shoe size for a period of 1–2 years. In our minds, this will adequately exclude patients who are still physically developing and may have a higher chance of recurrence. Surgery should not be considered in a patient with a history of rapidly enlarging breasts over a short time period, and may warrant further workup. Although rare and poorly described in literature, virginal mammary hypertrophy or gigantomastia can be the cause of rapidly enlarging breasts in the young female, and requires a different approach to workup and treatment [23].

Despite the complications associated with this procedure, long-term follow-up in our cohort of patients shows good overall long-term satisfaction and improvements in quality of life. Overall, 88% reported at least moderate improvement in quality of life after surgery. Combined, 94% rated the overall success of their surgery at least 50% successful. A total of 86% would recommend the surgery to a family member or friend at the same age. Knowing what they know now, 96% would have this surgery again. In the subgroup of patients <18 years of age at the time of surgery, these percentages, if not equivalent, were actually higher. In this subgroup, a combined 100% rated the overall success of the surgery at least 50% successful.

This study has limitations. It is a retrospective study of a Midwest mixed rural and urban population at a single institution. The survey was designed early on with our institution's survey research center, but is not validated. Recall bias is introduced when asking patients to recall how they felt 1 week after surgery. Multiple surgeons and different techniques were used, although the basic tenants of a reduction mammoplasty have effectively not changed over the period studied. Although the pedicle (blood supply to the nipple areola complex) may differ, patient-perceived differences, such as aspects of the incision or amount of tissue removed, would not. Unfortunately, we did not examine serial body mass index counts examining weight changes and oral contraceptive use, which could influence breast size and symptoms. A future prospective study might analyze self-perception, comfort/function, and psychosocial symptoms before and after surgery.

We chose to include patients <21 years of age at the time of surgery. Whereas adolescence is a recognizable phase of life, its end is not always easily demarcated, which poses problems when describing restrictive age limits [25]. Although the World Health Organization defines adolescents as being aged 10–19 years, this definition is a rough estimate, and medical providers for this population must allow for flexibility in this age span [25]. Prior studies reviewed on adolescent reduction mammoplasty varied on the upper age limit, with the highest including patients <21 years of age. Plastic surgery has long been a specialty with roots in psychology. Interestingly, G. Stanley Hall,

the forefather of research in adolescent psychology, defined adolescence as occurring between the ages 14 and 24 years [26]. Because older patients in our population may have attained physiological or skeletal maturity, a subgroup analysis of patients <18 years old at the time of surgery was performed that demonstrated equivalent results, if not better.

The youngest patient in our population was 16 years of age, even though many patients younger than this have benefited from this procedure. The barrier we find most often at our institution is the primary care physician or parent who is unaware of the signs and symptoms of macromastia and/or is wary to refer a patient of that age who would otherwise benefit from surgery, possibly deferring until the patient is older. Few plastic surgeons have had an adolescent who underwent a reduction mammoplasty come back later in life wishing they had not undergone the surgery. On the contrary, many plastic surgeons have heard from patients who wished they could have undergone the procedure at a younger age.

Female patients <21 years of age experience the same short- and long-term outcomes after reduction mammoplasty as adult patients. Excellent symptom resolution occurs, as has clearly been shown in adults. Decreased nipple sensitivity, scarring, and breast-feeding issues are all possible long-term sequelae. It is important to provide a comprehensive preoperative education to all patients being considered for this procedure. Long-term follow-up of younger female patients undergoing this procedure shows positive outcomes. Delaying surgery in this age group only delays the good overall satisfaction and improvements in quality of life that we have shown continue into adulthood.

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