Primary Breast Augmentation Using Axillary Skin Incision, Submuscular Implants, and Intraoperative Tissue Expansion

Jan B. Wieslander, MD, PhD

Background: Primary breast augmentation in small, pointed, or tubular breasts using axillary skin incision, submuscular cohesive gel implants, and intraoperative tissue expansion dramatically reduces complications.

Methods: A 2.5- to 3.5-cm-long incision is made in the hair-bearing part of the axillae beside a natural fold. Incisions are opened using dissection away from the axillae, and an opening is made underneath the muscle on top of the thoracic cage. Blunt finger dissection is performed, and temporary breast expanders and special dissectors are inserted. The expanders create volume and desired breast shape. Sterility is ensured by entering implant pockets only with expanders and elevators and changing gloves before placing implants. No irrigation or antibiotic solution is used on implants or in the pockets. One thousand three hundred ten breast augmentations were performed between 2004 and 2019 (including a 2-year follow-up) using textured, cohesive round implants. Patients were followed up 3–4 months postoperatively. The parameters analyzed were size, shape, firmness, scars, and sensation in the nipple areola complexes. Patients contacted the clinic if problems occurred.

Results: Of the 1,310 patients, only 2 had a Baker grade 3–4 capsular contraction. We also found 2 cases of implant rupture at the end of the 10-year guarantee period. Implants were replaced with identical ones. No infections were seen. Six cases of implant malposition were corrected by surgery. The total number of reoperations was 10 (0.8%).

Conclusions: The axillary skin incision is an extremely efficient technique with few complications. The lymphatic drainage system is preserved, and implant pockets are left in a virgin state. *(Plast Reconstr Surg Glob Open 2020;8:e2825; doi: 10.1097/GOX.0000000000002825; Published online 8 June 2020.)*

INTRODUCTION

Cronin and Gerow[1] introduced the silicone implants in the 1960s, followed by Trouques[2] in 1972. A complication associated with this type of implant is capsular contracture. Most professionals agree that the new cohesive, textured silicone gel implants placed in a submuscular position lead to fewer postoperative complications such as capsular contracture. Women also want less conspicuous scars than those left by inframammary and periareolar incisions.[3] We found earlier that intraoperative tissue expansion is an excellent tool for creating breast implant pockets. We therefore began to make transaxillary skin incisions within the hair-bearing area.[4–11]

Preoperative markings included measurements of the original and the planned submammary folds to the umbilicus (Figs. 1, 2). Care was taken not to deepen the prolonged lateral breast wall, common in pectus carinatum or in an asymmetrical thoracic cage. We recognized the low complication rates of this technique and have thus used it from 2002 until today (December 2017), with a 2-year follow-up to 2019.

A single type of textured, round implants were used (Perthese, Bornel, France). These implants have a trilaminar silicone envelope that consists of an internal and external layer of highly mechanical-resistant medical-grade silicone elastomer and an intermediate barrier layer to significantly reduce gel bleed.

Disclosure: *The author has no financial interest to declare in relation to the content of this article.*

The inclusion criteria for our study were women aged over 18 years (the age of majority in Sweden) who were physically and mentally healthy. The patients regarded their breasts as abnormal.

The study also included a number of patients between 15 and 17 years of age whose parents had consented to the surgery, due to serious social and psychological problems resulting in suicidal risk.

Patients with severe breast deformities such as tubular breasts were accepted, but in such cases, a mastopexy was usually performed. All surgeries took place in 1 session.

MATERIAL

A consistent technique using the same textured implants (Perthese) was used from 2002 until 2017 in 2,620 implants. Nine of them were ultra-high with the same microtexture and 3 laminar shells. Moderate profile was used in 6 cases. There were 1,310 primary augmentations. Patients were 15–65 years of age. To include a 2-year follow-up, the study was stopped in 2017 and finished in 2019. Augmentations of small pointed breasts similar to tubular breasts were regarded as primary if only the constricting rings around the areolae were cut but no mastopexies performed.

METHODS

We made incisions of 2.5–3.5 cm in length and then manually dissected up to the border of the major pectoral muscle, creating a small space in the submuscular plane (Figs. 1–9). Mentor tissue expanders (Mentor Medical Systems, Lieden, Netherlands) for intraoperative use were inserted and implant pocket preparation started when the expander filling had begun. At the same time, the Wieslander Transaxillary Breast Dissector (elevator) was inserted. The combination of simultaneous breast augmentation using expanders and elevators provided an opportunity to judge the location of the submammary folds, thus ensuring symmetry and an appropriate

Fig. 1. Postoperatively: 1 year after primary breast augmentation using intraoperative tissue expansion and axillary approach. There are no scars on the breasts, and there is little trace of scars in the axillae.
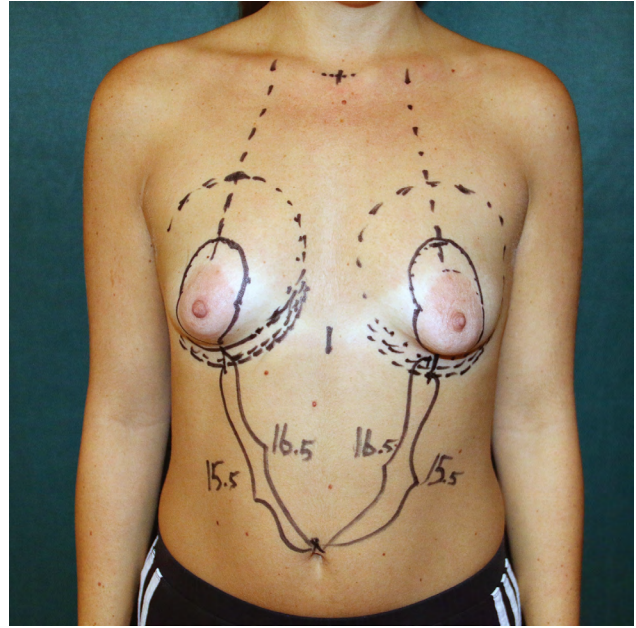
Fig. 2. The plan is to augment small ptotic breasts and make them symmetrical from the upper areolae edges to the jugulum and from new submammary folds to umbilicus. Axillary approach and pocket creation with intraoperative expansion.

distance between the breast mounds, resulting in an optimal cleavage. The creation of the lower pole in small symmetrical breasts and in breast deformities proved satisfactory. The combination of simultaneous expansion and elevation/dissection ensured atraumatic formation of the submuscular planes or, in some cases, the subglandular pocket.

All the patients in the study attended a first consultation at least 1 day before surgery. We discussed the type of incision (axillary, submammary, periareolar), volume, and shape of the implants. In 99% of the patients, we used Perthese (high, round-profile implants). The 10-year guarantee from the manufacturer covering capsular contraction (Baker scale grade 3–4) and any technical faults in the implants was also discussed, as was average implant survival. The most common implant size decided upon was 300–400 cm³. Markings on the skin surface indicating implant volume and size do not necessarily reflect implant volume and size in the submuscular plane. All other technical details were discussed such as the necessity of early shoulder training, to avoid fibrous banding[12–15] and the possible use of drains.

We have also discussed on the risks of cancer risks and lymphomas for 5 years.[16–19]

**Preoperative Care**

The patients washed themselves with Descutan 4% chlorhexidine gluconate antiseptic soap (Fresenius Kabi AB, Uppsala, Sweden) during 12 hours before surgery. Patients were marked in the axillary hair-bearing area and around the breast margins (lateral walls, medial walls, and the position of the old and the planned submammary folds, using the umbilicus as the reference point)
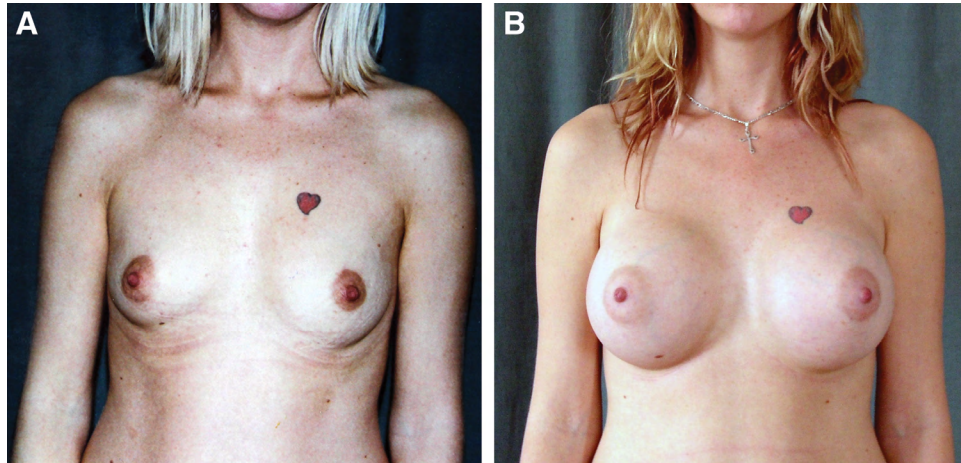
Fig. 3. Results of breast augmentation using our technique and implants performed in 2004 and evaluated in 2017, that is, after 15 years.


Fig. 4. Pectus excavatum before and after primary augmentation using our technique with axillary incisions and intraoperative expansion—important for intraoperative evaluation of pockets.
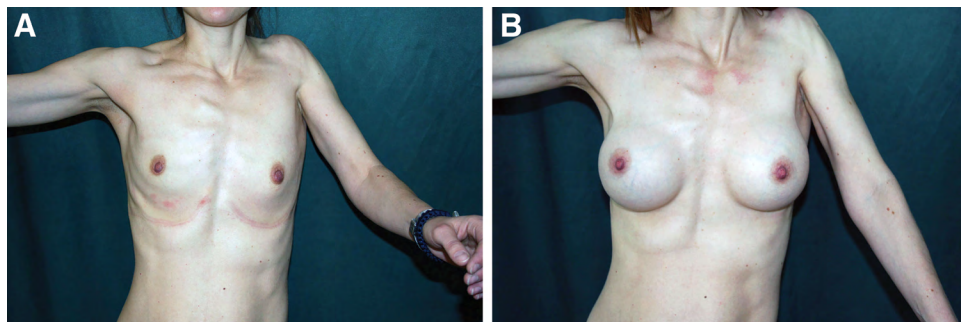

Fig. 5. Congenital paresis of left shoulder. Before (A) and after (B) augmentation using our technique. No scars on breasts.

(Fig. 2). The jugulum–nipple distance was measured and marked, as was the diameter and any asymmetry of the areolae. Large and asymmetrical areolae often required a reduction. We use the term areolaplasty to denote this symmetrical creation of areolae and thereby shortening of the jugulum–nipple distance.

These measurements were affected by thoracic deformities such as scoliosis, pectus excavatum, carinatum, and a unilateral dropped shoulder. The goal was to make the breasts appear symmetrical even if the measurements were not correct. All breast augmentations were performed under general anesthesia.
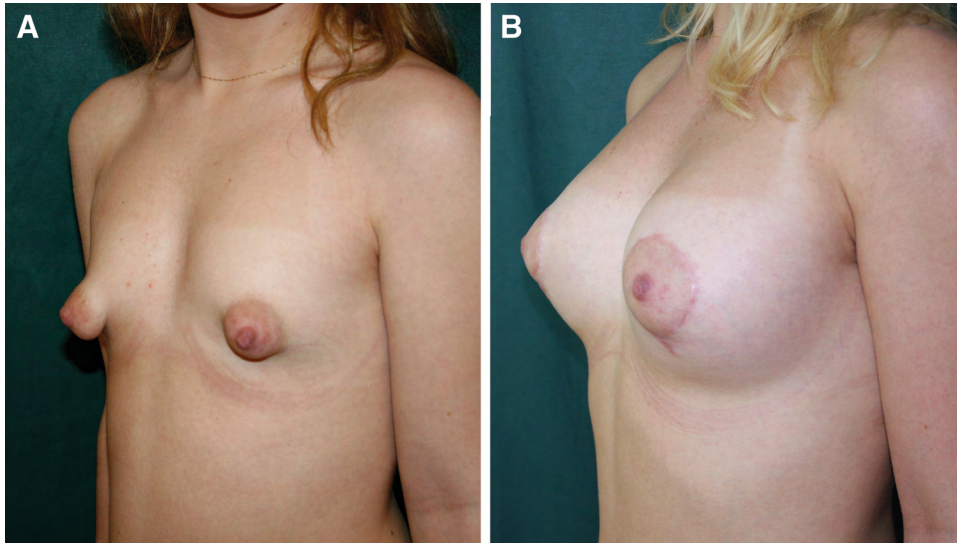
Fig. 6. Asymmetrical small and tubular breasts semiprofile. Before (A) and 2 years after (B) augmentation as described above combined with parachute incisions to correct ptosis and divisions of the constricting periareolar rings. B, The small scars below the areolae are slowly fading.
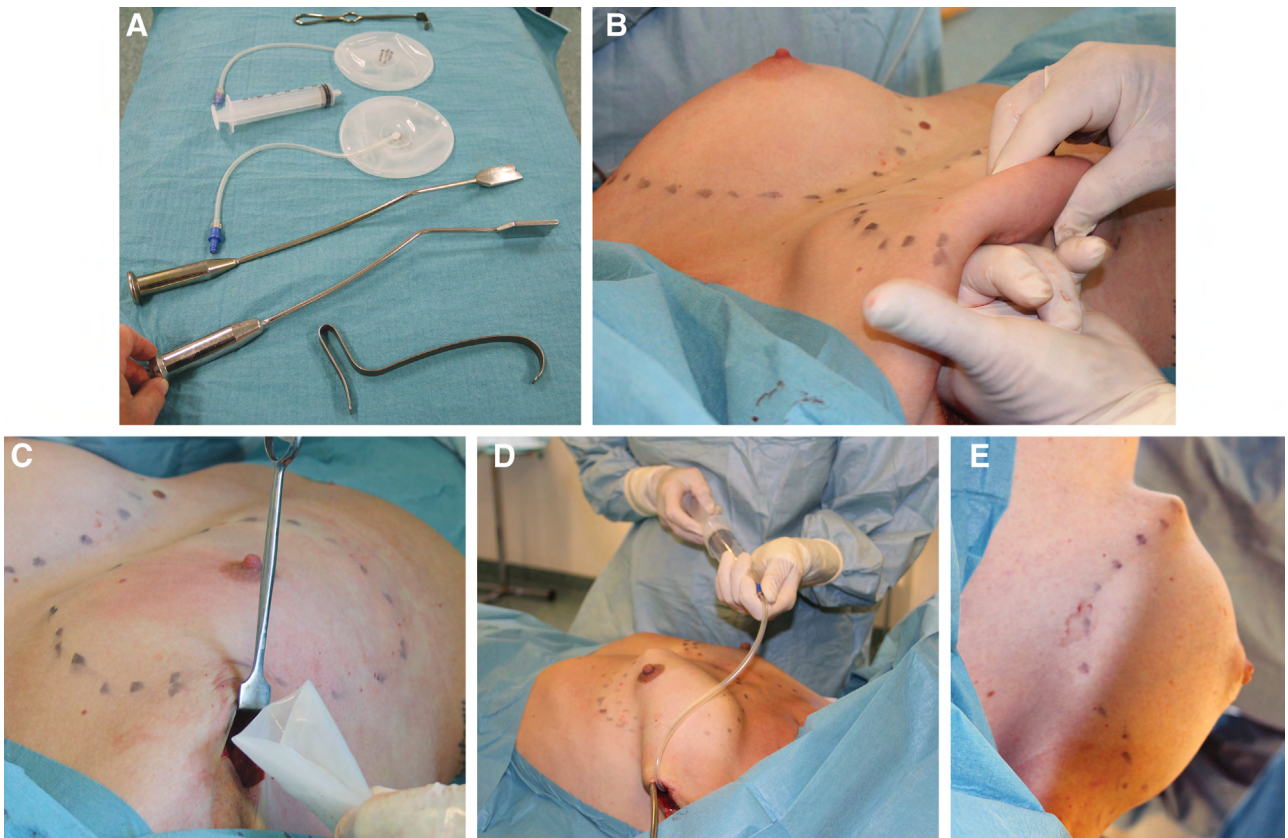
Fig. 7. The method. A, Instruments: intraoperative expanders, saline, Wieslander breast dissectors (2), and S-shaped elevator used when introducing implants in the pockets. B, Finger dissection. C, The expander is inserted. D, The end of the breast dissector is visible creating submammary folds 1.5–2 cm lower than the original folds according to the preoperative plan. A dual plane is not necessary due to efficient creation of lower breast poles using expanders and specific elevators. E, Volume increased with simultaneous elevation of submuscular plane using Wieslander dissector.
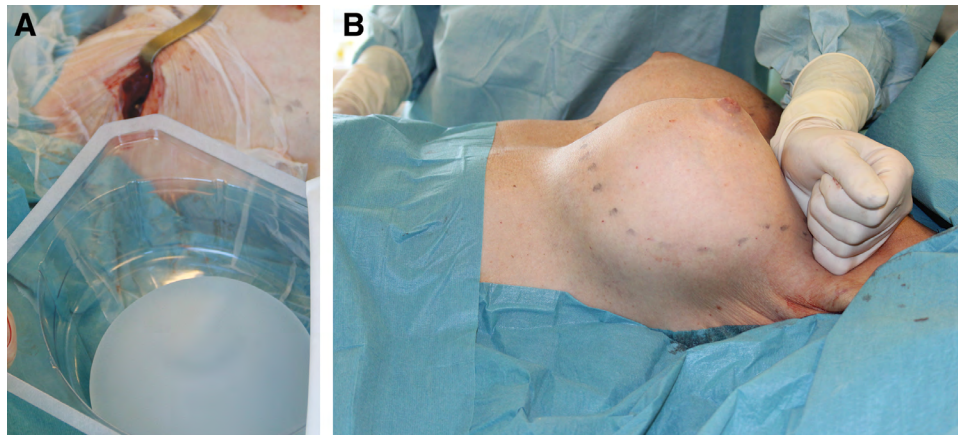
Fig. 8. The method. A, Implants are rapidly inserted through short incisions in the plastic film and closed with intradermal and skin sutures. B, Final test of breast volume and shape.
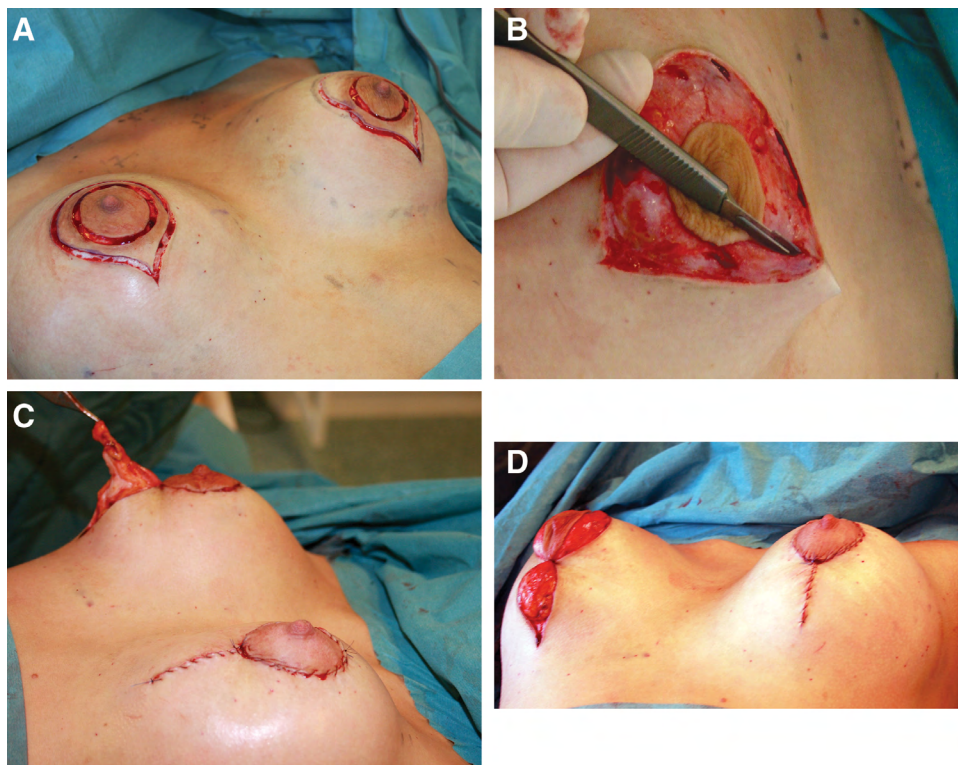
Fig. 9. The method. A, Parachute technique enables adjustment of areolae asymmetries. B, Combinations with pointed breasts rendered more harmonious by cutting the constricting ring. C, Excessive tissue in the lower breast pole is excised. D, Incisions are closed using intradermal sutures and superficial fine skin sutures.

The axillary incision was placed next to, but never inside, a fold. All skin markings, including the axillary (Figs. 2, 7A–E, 8A, B), were infiltrated with Xylocain (lidocaine 10 mg/ml + 5 mg/ml adrenalin; Astra-Zeneca, Södertälje, Sweden). Xylocain was mixed with Marcaine 5 mg/ml (bupivacaine, hydrochloride; Astra-Zeneca, Södertälje, Sweden) to prolong the duration of analgesia.

The axillary skin incision was judged preoperatively by elevating the patient's arms (Fig. 1), after which the incision was made. Scissors were used, but only in the opposite direction to the axilla. Finger dissection (Fig. 7B) was then initiated to identify the lateral border of the pectoralis major muscle. The edge of the pectoralis major muscle was opened in a more medial position in the fascia to facilitate identification of the ribs below the pectoralis major

and minor muscles. A small pocket was prepared by means of finger dissection with a "windscreen wiper" movement going laterally to muscle edges, and tissue expanders were inserted. Intraoperative intravenous antibiotics (cephalosporins or clindamycin) were used in normal doses. A Langenfeldt retractor was used to open the axillary skin incision, and elevators and expanders were inserted without touching the skin surface. We started on one side to allow expansion, while the other side was opened and a Mentor sizer (tissue expander) was inserted following the same procedure as on the first side. The expanders had a volume of 325 cm³ and a moderate profile, permitting expansion to 700–800 cm³ or more. In all cases, they were overfilled by 50–100 cm³ or more than the planned implant size.

The tissue expander was filled to approximately 200 cm³ by the assisting nurse as the breast dissector was inserted. The use of simultaneous tissue expansion below the pectoralis muscle ensured that we were working in the correct plane without damaging the muscle and vessels above (Figs. 7A–E, 8A, B). Part of the existing or the new submammary folds (generally 1.5–2.5 cm below) was released into the desired location. Expanders were left in place for a few minutes to ensure that the size and shape of the breast pockets were in accordance with the patient's (and doctor's) wishes. Lateral walls were extended but not deepened to prevent the implants from slipping down laterally. After evaluation of symmetry, pocket size, and shape, the expanders were removed and the incision sites covered with a thin plastic film. A small incision was made in the film (Steri-Drape; 3M Health Care, Neuss, Germany; Fig. 8A), and then, with new sterile gloves, the desired implants were opened and quickly inserted into the pockets using a Freeman Flap Retractor . Virtually no bleeding occurred, with the exception of the skin incision. If bleeding seemed profuse, a drain was inserted. No instruments were inserted into the pockets, except those described above. Nor was gauze or irrigation used inside the pockets. Expanders ensured the correct planes of dissection, and when positioned, the implants had a blood-stilling effect. All incisions were closed subdermally with 4/0 Vicryl sutures and the skin with Ethilon*II polyamide 4-0 sutures. Any air or fluid was evacuated. All incisions in the axillae were only covered with gauze.

Breasts were then shaped/stabilized with Mefix 5-cm elastic tape. The intraoperative expansion became stable because it was immediately secured by the implants.

The placement of elastic tape over the upper breast poles and light pressure just below the new implant submammary folds was important. Painkillers, including morphine derivates, and muscle relaxants were administered as needed. The operating time was normally 40–60 minutes.

Postoperative Care

Patients were observed and monitored using pulse oximetry during the first hours postoperatively. Most of the patients could leave the ward after 4–6 hours. Antibiotics were continued postoperatively for 7 days.

On the fourth postoperative day, patients were asked to raise their arms 10 times on 3 occasions (morning, noon, and evening) to prevent scar contracture in the axillae. Sutures were removed 5–9 days postoperatively.

RESULTS

Patients attended a follow-up after 4 months, when we addressed scars in the axillae, sensation in the nipple areola area, symmetry, and satisfaction with shape, volume, and softness. If any problem, patients were asked to return for a new follow-up after 6 months.

Patients were also contacted at 5 years, 10 years, and 15 years (postoperatively), and they filled out a breast study answering the same questions as above. The results are presented below: 2004–2008, 484 implant years; 2009–2013, 270 implants years; 2014–2019, 264 implant years (Table 1).

Sensation in the nipples was sometimes affected for several months. Normally, there was an increased sensation accompanied by paresthesias. Only in a few cases was sensation diminished. However, sensation always normalized within –2–6 months.

We performed 1,310 primary patient augmentations. There was no difference when comparing primary augmentations with submuscular implant placement and a small group of patients (41) with subglandular implants. The first capsular contracture was unilateral, but after some months, a second occurred on the patient's other side. This patient had tonsillitis shortly

Table 1. Results of 1,310 Primary Augmentations/2620 Implants

Complication	No. Patients Affected	Measures Taken to Treat Complication
Decreased sensation	1 (previous thoracotomy)	
Capsular contraction	2/1,310 patients	Reoperation
Infection	0	
Seromas	0	
Rippling (Fig. 11B)	A few cases with low BMI	
Contraction (Fig. 10, right)		All normalized within days or weeks
Malposition	6 implants, 0.23%	
Bleeding	25 implants, 0.95%	Treated using drains—never open surgery
Fibrous banding	Only occurred if patients did not follow the planned exercises	All receded with proper arm/shoulder exercises (see text)
Implant rupture	2/2,620 implants	Reoperation
Lymphoma	0	
Total number of reoperations	10/1,310 patients = 0.76%	

BMI, body mass index.

Fig. 10. Contraction just below areolae is always normalizes a few weeks postoperatively.

after the first surgery. The capsules were removed using short inframammary incisions and identical Perthese implants were inserted. The postoperative course was uneventful.

The most common complication was malposition of one implant (Fig. 11A), which caused asymmetry of the submammary folds. This occurred in 6 patients. The asymmetry usually existed even before surgery. It was corrected by means of a minimal submammary fold incision (2.5–3.5 cm.) opening the biological capsule and lowering the implant.

Capsular contraction of the right breast (Fig. 10). Rippling (Fig. 11B) was seen in a few patients when leaning forward. These patients had a low body mass index

and very thin cutaneous and muscular coverage of the implants.

Axillary Skin Incisions and Subcutaneous Fibrous Banding

The scars of incisions next to a fold in the hair-bearing area virtually vanished within 2–8 months (Fig. 1). Subcutaneous fibrous bands occurred in a few cases, all of which subsided after some weeks.[12–15] These types of scars never occurred if the patients started arm/shoulder exercises on the fourth day postoperative. In a few cases, cortisone was then administered into the scar in the axilla, and the surgeon performed thumb pressure on an elevated arm on 2–3 occasions. Infection of the axillary implant pockets was never observed.

Bleeding occurred in the preparation of 25 out of 2,723 implant pockets. These bleedings were detected intraoperatively or shortly thereafter while the patients were still on the postoperative ward. All bleedings were treated with vacuum drains until maximum 20 ml was evacuated in 24 hours, but never with open surgery. Drains were no contraindication to leaving the clinic but increased safety.

DISCUSSION

We started using Perthese implants in 2002, and their characteristics have remained the same. This guarantees the same fine texture every time. The manufacturer's 10-year guarantee covered Baker grades 3–4 capsular contracture and any defect in the implants. The manufacturer also informed us that implants would likely remain intact for 25–30 years. We had 2 implant ruptures at the end of the 10-year guarantee period due to unknown causes. Patients sometimes regretted the primary choice of implant size and returned after 1 or 2 years for a change to the same kind of implants but 100–200 cm^3 larger. Only 2 patients changed early to smaller or no implants. Patients with primary augmentations choose larger implants to correct ptosis following pregnancy, sometimes with a mastopexy.
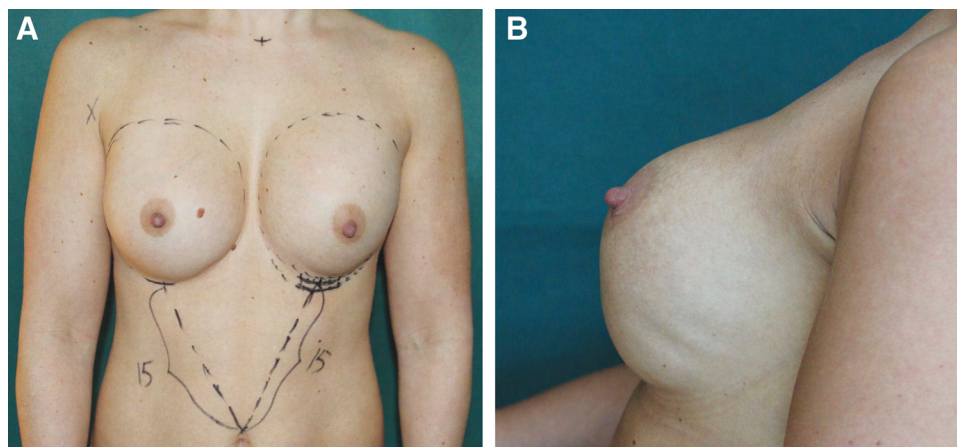
Fig. 11. The method. A, Malposition of left implant, postoperatively. A lowering of the left implant is planned using surgery. B. Rippling is rare and occurs in thin patients. A change of implants usually does not help.

There has been a debate whether axillary skin incisions destroy normal lymphatic vessels endangering lymph flow from the glands to the nodes in the axillae. If so, it would have a great bearing on sentinel node mapping in breast cancer patients. Several investigations demonstrate that lymph vessels are not destroyed by axillary skin incisions and do not affect lymph node mapping.[20]

We had an extremely low rate of capsular contraction (2 out of 1,310 patients). The patient who presented with bilateral capsular contracture (after 2–3 months) developed tonsillitis the week after the breast augmentation. A small submammary incision (2–3 cm) was made, and most of the capsule, except for that on the lateral wall and under the implant, was removed and a drain inserted. The patient experienced no recurrence.

The implant texturing method produces a fine texture sufficient for protecting against capsular contracture and lymphoma.[17–19] Furthermore, the 3-layer laminar shell makes the implants durable and provides high elasticity, which is necessary because a certain level of force and a special technique are required (Figs.7A–E, 8A, B) to insert the implants through the small axillary (2.5–3.5 cm) opening.

The Technique

The implant patch is introduced, then implant walls are gradually rotated into the pocket. Finally, shaking of the implant is effective, lowering viscosity. Very large implants (600–900 cm³) have been used and incisions prolonged.

Implants in the Submuscular Plane

The advantage of intraoperative tissue expansion (Fig. 7C–E) is the possibility to judge volume and size intraoperatively.

Malposition of Implants

The most common complication was one implant looking too high, leading to a high submammary fold, causing asymmetry. The submammary folds were often asymmetrical before surgery. This happened in 6/2,620 cases and if patients wore bras that exerted upward pressure on one submammary fold. An insufficient lower breast pole could also cause asymmetry. In women with small or tubular breasts, the distance between the nipples and the medial walls of the breasts was often too large. This was difficult to correct, especially if the thoracic cage was asymmetrical, with one lateral wall much steeper than the other. Postoperatively, it is important to wear bras that do not exert pressure on the lateral walls, as the nipple areola complexes tend to move even further apart. The remedy is to wear a bra with a pull toward the midline (Fig. 12).

The correction of malpositioned implants and submammary folds involves surgery. A short incision is made directly below the planned submammary fold. The biological capsule is opened, avoiding the implant, which is then pulled downwards to just below the planned new submammary fold, making the upper breast pole smaller.
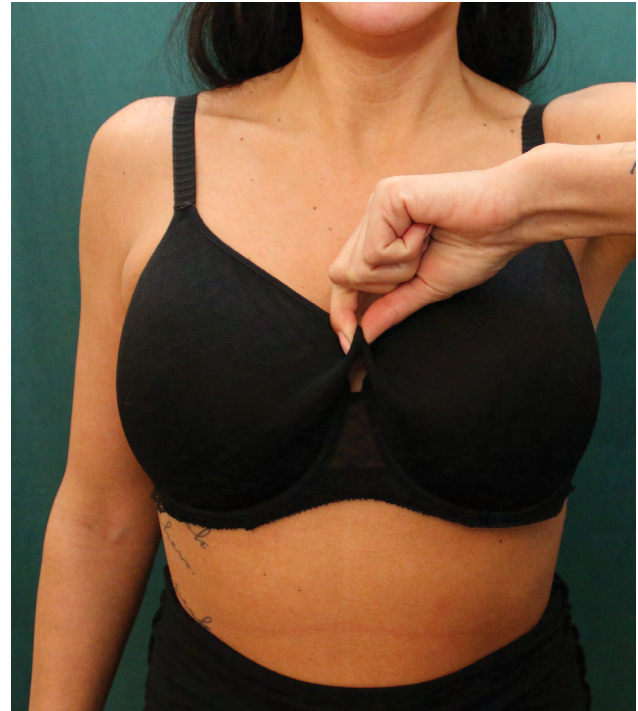
Fig. 12. Lateralized breasts should not be pressed toward the middle, but pulled medially.

Drainage is always used after such corrections. Bleeding rarely occurs during the first hours after surgery but could occur at a later stage. The new submammary fold is protected using elastic tape, and light pressure is applied to the upper breast pole.

No seromas were detected in primary breast augmentations. However, seromas could occur for days or even weeks when implants had been changed from smooth to textured or to a different type of texture. Drains were
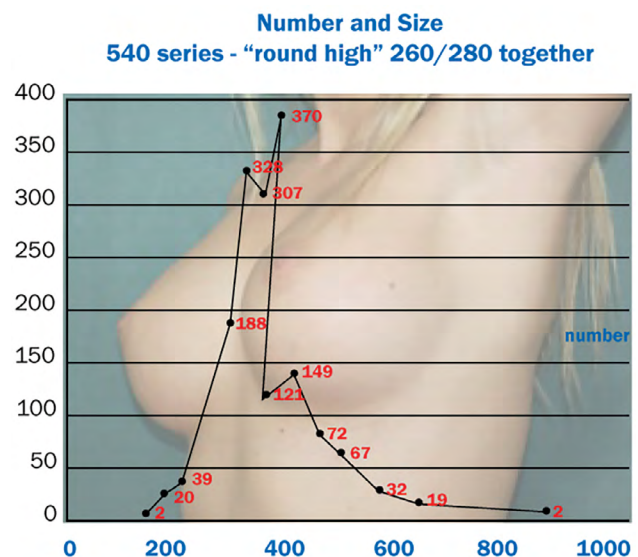
Fig. 13. The distribution of implant volumes from 2004 to 2014.

placed through the axillary skin incision, thereby collecting blood, air, and fluid in the pocket. Drains served as a protection against later complications, such as capsular contracture and infection.

A change of implant texture, shape, or cohesivity did usually not solve the problem of rippling (Fig. 11B) or contraction of lower breast pole (Fig. 10, right).

We have had few complications in our material like capsular contracture, implant rupture, and malposition of implants (Fig. 11A), leading to reoperations.

Virtually all articles discussing complications take up cohesivity, smooth and textured surfaces, and the shape of implants.[21,22] There are several other factors, like the method in shaping breast implant pockets, avoiding irrigation, that are important for the final number of complications. We believe that our low complication rates depend on the methods of creating implant pockets. We have never used endoscopy or dissected the pockets with electrocoagulation. We regard this as a more traumatizing method, leading to more complications. Our technique of intraoperative tissue expansion and simultaneous elevation of the muscle roof cause minimal trauma to the implant pocket. Many articles regarding technique are the same as ours, but we cannot agree with some of them.[21,22]

Comparison with Complications in Published Materials

Wieslander JB: capsular contracture 2/1,310 patients, 0.15%.

Wieslander JB: reoperations, 0.08%; rupture rates, 0.15%.

CONCLUSIONS

The strength of this study is the uniform technique, using intraoperative tissue expansion combined with a breast dissector/elevator, and using the same fine microtextured implants every time. The low complication rates in the case of capsular contracture are a result of the axillary skin incision technique, intraoperative tissue expansion, and great care to avoid contaminating the implant pocket, which is thus left in a virgin state.

Jan B. Wieslander, MD, PhD
The Institute of Plastic Surgery
Lilla Varvsgatan 11
21117 Malmoe, Sweden
E-mail: wieslander@plastikinstitutet.se

PATIENT CONSENT STATEMENT
Patients provided written consent for the use of their images.

REFERENCES

1. Cronin TD, Gerow FJ. Augmentation mammoplasty: a new "natural feel" prosthesis. Paper presented at: Transactions of the Third International Congress of Plastic Surgery. October 13–14, 1963; Amsterdam, The Netheralnds: Excerpta Medica Foundation; 1964.
2. Trouques R. Implantation des prostheses mammaires par incision axillaire. *Nouvelle Presse Med.* 1972;1:2409.
3. Jacobson JM, Gatti ME, Schaffner AD, et al. Effect of incision choice on outcomes in primary breast augmentation. *Aesthet Surg J.* 2012;32:456–462.
4. Hoehler H. Breast augmentation: the axillary approach. *Br J Plast Surg.* 1973;26:373–376.
5. Handel N, Jensen JA, Black Q, et al. The fate of breast implants: a critical analysis of complications and outcomes. *Plast Reconstr Surg.* 1995;96:1521–1533.
6. Eisman G. Augmentation mammaplasty by the transaxillary approach. *Plast Reconstr Surg.* 1974;54:229–232.
7. Pickering P, Moore L, Vecchione T, et al. Augmentation mammaplasty: a critique of favorable and unfavorableresults. In: Owsley J, Peterson R, eds. Symposium on Aesthetic Surgery of the Breast. St Louis: Mosby; 1978.
8. Hakelius L, Ohlsén L. Tendency to capsular contracture around smooth and textured gel-filled silicone mammary implants: a five-year follow-up. *Plast Reconstr Surg.* 1997;100:1566–1569.
9. Malata CM, Feldberg L, Coleman DJ, et al. Textured or smooth implants for breast augmentation? Three year follow-up of a prospective randomised controlled trial. *Br J Plast Surg.* 1997;50:99–105.
10. Hall-Findlay EJ. Breast implant complication review: double capsules and late seromas. *Plast Reconstr Surg.* 2011;127:56–66.
11. Hall-Findlay EJ. Reply letters: breast complication review: double capsules and late seromas. *Plast Reconstr Surg.* 2011;127:1300–1310.
12. Maxomovich SP. Transient axillary-upper inner arm subcutaneous fibrous banding following transaxillary subpectoral endoscopic breast augmentation. *Plast Reconstr Surg.* 1996;97:1304–1305.
13. Young RV, Bindrup JR. Transaxillary submuscular breast augmentation and subcutaneous fibrous bands. *Plast Reconstr Surg.* 1997;99:257.
14. Laufer E. Fibrous bands following subpectoral endoscopic breast augmentation. *Plast Reconstr Surg.* 1997;99:257.
15. Dowden RV. Subcutaneous fibrous banding after transaxillary subpectoral endoscopic breast augmentation. *Plast Reconstr Surg.* 1997;99:257.
16. Taylor KO, Webster HR, Prince, HM. Anaplastic large cell lymphoma and breast implants: five Australian cases. *Plast Reconstr Surg.* 2012;129:610e–7e.
17. Hu H, Jacombs A, Vickery K, et al. Chronic biofilm infection in breast implants is associated with an increased T-cell lymphocytic infiltrate: implications for breast implant-associated lymphoma. *Plast Reconstr Surg.* 2015;135:319–329.
18. Loch-Wilkinson A, Beath KJ, Knight RJW, et al. Breast implant-associated anaplastic large cell lymphoma in Australia and New Zealand: high-surface-area textured implants are associated with increased risk. *Plast Reconstr Surg.* 2017;140:645–654.
19. Hammond D. Anaplastic large cell lymphoma: the role of particulates. Aesthetica Symposium. Las Vegas, March 3, 2018.
20. Mottura AA, Del Castillo R. Transaxillary breast augmentation: two breast cancer patients with successful sentinel lymph node diagnosis. *Aesthetic Plast Surg.* 2007;31:544–549; discussion 550–552.
21. Adams W, Afrooz P, Stuzin J. Tissue based planning and technique for breast augmentation with anatomical implants. *Plast Reconstr Surg.* 2019;143:1634–1636.
22. Gabriel A, Maxwell GP, Disa J. Introduction to "utilising a spectrum of cohesive implants in aesthetic and reconstructive breast surgery." *Plast Reconstr Surg.* 2019;144:5S–6S.
23. Hedén P, Jernbeck J, Hober M. Breast augmentation with anatomical cohesive gel implants: the world's largest current experience. *Clin Plast Surg.* 2001;28:531–552.