Breast implant

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A **breast implant** is a prosthesis used to enlarge the size of a woman's breasts (known as **breast augmentation**) for cosmetic reasons, to reconstruct the breast (e.g. after a mastectomy or to correct genetic deformities), or as an aspect of male-to-female sex reassignment surgery. According to the American Society of Plastic Surgeons, breast augmentation is the third most commonly performed cosmetic surgical procedure in the United States. In 2005, 291,000 breast augmentation procedures were performed.[1]

There are two primary types of breast implants: saline filled and silicone gel filled implants. *Saline implants* have a silicone elastomer shell filled with sterile saline liquid. *Silicone gel implants* have a silicone shell filled with a viscous silicone gel.

Contents

History

Implants have been used since 1895 to augment the size or shape of women's breasts. The earliest known implant was attempted by Czerny, using a woman's own adipose tissue (from a lipoma, a benign growth, on her back).[2] Gersuny tried paraffin injections in 1889, with disastrous results. Subsequently, in the early to mid-1900s, a number of other substances were tried, including ivory, glass balls, ground rubber, ox cartilage, Terylene wool, gutta percha, Dicora, polyethylene chips, polyvinyl alcohol-formaldehyde polymer sponge (Ivalon), Ivalon in a polyethylene sac, polyether foam sponge (Etheron), polyethylene tape (Polystan) or strips wound into a ball, polyester (polyurethane foam sponge) Silastic rubber, and teflon-silicone prostheses.[2] (http://www.nap.edu/books/0309065321/html/21.html) In recent history, various creams and medicaments have been used in attempts to increase bust size, and Berson in 1945 and Maliniac in 1950 performed a flap-based augmentation by rotating the patients chest wall tissue into the breast to add volume. Various synthetics were used throughout the 1950s and 1960s, including silicone injections, which an estimated 50,000 women received.[3] Development of silicone granulomas and hardening of the breasts were in some cases so severe that women needed to have mastectomies for treatment. Women sometimes seek medical treatment for complications up to 30 years after receiving this type of injection.

Indications

Clinical indications for the use of breast implants are for breast reconstruction, sex reassignment surgery, and for abnormalities that affect the shape and size of the breast. In some countries health insurers will reimburse insertion of breast implants only for these indications. Non-clinical indications (the most common reasons) are cosmetic.

Patient characteristics

Patients seeking breast augmentation are usually younger, healthier, and from higher socio-economic status than the population at large.[4] Many of these patients have greater distress about their appearance in a variety of situations, and have endured more frequent teasing about their appearance. Studies have identified a pattern (shared by many cosmetic surgery procedures) that suggest women who undergo breast implantation are slightly more likely to have undergone psychotherapy, have low levels of self-esteem, and have higher prevalences of depression, suicide attempts and mental illness as compared to the general population.[5] Post-operative surveys on mental health and quality of life issues have shown improvement on a number of dimensions including: physical health, physical appearance, social life and self confidence.[6][7][8] The large majority of patients reports being satisfied long-term with their implants even when they have required reoperation for complications or aesthetic reasons.[9] [6]

Types of implants

Saline implants

Saline-filled breast implants were first manufactured in France in 1964, introduced by Arion[10] with the goal of being surgically placed via smaller incisions. These original devices had a high failure rate and were discontinued in the early 1970s . The current devices are manufactured with thicker, room temperature vulcanized (RTV) shells. These shells are made of silicone elastomer and the implants are filled with salt water after the implant is placed in the body. Since the implants are empty when they are surgically inserted, the scar is smaller than is necessary for silicone gel breast implants (which are filled with silicone before the surgery is performed).

Saline-filled implants are the most common implant used in the United States due to restrictions on silicone implants, but are rarely used in other countries. Good to excellent results may be obtained, but as compared to silicone gel implants, saline implants are more likely to cause cosmetic problems such as rippling, wrinkling, and be noticeable to the eye or the touch.

Particularly for women with very little breast tissue, or for post-mastectomy reconstruction, plastic surgeons believe that silicone gel implants are the superior device. In patients with more breast tissue, however, saline implants can look very similar to silicone gel.

Silicone gel implants

Thomas Cronin and Frank Gerow, two Houston, Texas, plastic surgeons, developed the first silicone breast prosthesis with the Dow Corning Corporation in 1961. The first woman was implanted in 1962.

Silicone implant generations

Silicone implants are generally described in terms of five generations which segregates common characteristics of manufacturing techniques.

Table I: Generations of Silicone Gel Filled Breast Implants

Implant Generation	Production Period	Characteristics
1st Generation	1960s	Thick Shell (0.25mm average) Thick, Viscous Gel Teardrop shape Dacron Patch
2nd Generation	1970s	Thin Shell (0.13mm average) Less Viscous Gel Dacron Patch discontinued Double Lumen Implants Introduced Polyurethane Implants Introduced Round shape
3rd Generation	1980s - 1992	Thick, Barrier Coat Shells Round shape
4th Generation	1992-present	Stricter manufacturing standards; Refined 3rd Generation devices More Cohesive Gel Textured Surfaces Round & Anatomic Shapes
5th Generation	1993-present	Highly Cohesive Gel Form-stable Anatomic Design

- **First generation**

The Cronin-Gerow implants were made of a silicone rubber envelope (or sac), filled with a thick, viscous silicone gel with a Dacron patch on the posterior shell.[11] They were firm and had a "teardrop" anatomic shape.

- **Second generation**

In response to surgeons' requests for softer and more lifelike implants, breast implants were redesigned in the 1970s with thinner gel and thinner shells. These implants had a greater tendency to rupture and leak, or "bleed" silicone through the porous shell, and complications such as capsular contracture were also quite common. It was predominantly implants of this generation that were involved in the class action-lawsuits against Dow-Corning in the early 1990s. Another development in the 1970s was a ***polyurethane foam coating*** on the implant shell which was effective in diminishing capsular contracture by causing an inflammatory reaction that discouraged formation of fibrous tissue around the capsule. These implants were later discontinued due to concern of potential carcinogenic breakdown products from the polyurethane.[12] A review of the risk for cancer from TDA by the FDA later concluded that the risk was so small so as not to justify removal of the devices. Polyurethane implants are still used in Europe and South America, but no manufacturer has sought FDA approval for sale in the United States.[13] Second-generation implants also included various **"double lumen" designs**. These implants were essentially a silicone implant inside a saline implant. The double lumen was an attempt to provide the cosmetic benefits of gel in the inside lumen, while the outside lumen contained saline and its volume could be adjusted after placement. The failure rate of these implants is higher than for single lumen implants due to their more complex design. The contemporary versions of these devices ("Becker Implants") are used primarily for breast reconstruction.

- **Third & Fourth generation**

Third & fourth generation implants, represented sequential advances in manufacturing principles and were elastomer-coated to decrease gel bleed, and a filled with thicker, more cohesive gel. These implants are sold under restricted conditions in the U.S. and Canada, and are widely used in other countries. The increased cohesion of the gel filler reduces leakage of the gel compared to earlier devices. A variety of both round and tapered anatomic shapes are available. Anatomic shaped implants are uniformly textured to reduce rotation, while round devices are available in smooth or textured surfaces.


Silicone gel-filled breast implants (3rd generation)

- **Fifth generation**

Evaluation of "gummy bear" or high-cohesive, form-stable implants is in preliminary stages in the United States but enjoys wide use in the rest of the world. It is believed that the high degree of gel cohesion in these implants is likely to eliminate or significantly reduce the possibility of silicone migration. Early reports of these devices have shown excellent safety and efficacy. [14][15][16]

Silicone implant crisis of early 1990s

Image:Cohesive gel.gif
Cohesive gel implant

Although silicone gel-filled breast implants were introduced into the US market decades prior, the FDA did not have a statutory basis to regulate most medical devices until the late 1970s. After a number of anecdotal reports surfaced alleging problems in patients with gel implants, the FDA asked for and reviewed hastily assembled data submitted by several implant manufacturers. They later concluded that the amount of data presented was not sufficient to prove safety but did not necessarily reflect any evidence of an associated risk between the devices and disease. In 1992, amid intense political pressure and media publicity, the FDA reclassified the devices as experimental and restricted silicone gel-filled breast implants to clinical trials, primarily for women needing reconstruction after mastectomy or breast deformity, or for women with implants that need to be replaced. Prior to the FDA's restrictions on silicone gel-filled implants in 1992, approximately 97% of women who underwent breast implant surgery chose to have silicone gel-filled implants. In November 2006, the FDA reapproved silicone implants for cosmetic and reconstructive indications.[17]

. In Canada, a similar series of events occurred where silicone gel-filled prostheses were restricted by Health Canada in 1992 prior to a limited reintroduction in 1999. A 2005 Canadian panel of experts reviewed the data and research again, and found no compelling reason to restrict access to the devices[18], and in October 2006, Health Canada removed the restrictions on the use of these implants[3] (http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&pubid=968163964505&cid=1161342014455&col=968705899037&call_page=TS_News&call_pageid=968332188492&call_pagepath=News/N
. No other countries in the world have any significant restrictions on access to silicone breast implants.

Implant placement techniques

Incision types

Breast implants for augmentation may be placed via various types of incisions:

- **Inframammary** - an incision is placed below the breast in the infra-mammary fold (IMF). This incision is the most common approach and affords maximum access for dissection and placement of an implant. It is often the preferred technique for silicone gel implants due to the longer incisions required.
- **Periareolar** - an incision is placed along the areolar border. This incision provides an optimal approach when adjustments to the IMF position or mastopexy (breast lift) procedures are planned. The incision is generally placed around the inferior half, or the medial half of the areola's circumference. Larger silicone gel implants are difficult to place via this incision.
- **Transaxillary** - an incision is placed in the armpit and the dissection tunnels medially. This approach allows implants to be placed with no visible scars on the breast. Transaxillary procedures can be performed with or without an endoscope (tiny lighted camera).
- **Transumbilical (TUBA)** - a less common technique where an incision is placed in the navel and dissection tunnels superiorly. This approach enables implants to be placed with no visible scars on the breast, but makes appropriate dissection and implant placement more difficult. Transumbilical procedures may be performed bluntly or with an endoscope (tiny lighted camera) to assist dissection. This technique is not appropriate for placing silicone gel implants due to potential damage of the implant shell during blunt insertion.
- **Transabdominoplasty (TABA)** - procedure similar to TUBA, where the implants are tunneled up from the abdomen into bluntly dissected pockets while a patient is simultaneously undergoing an abdominoplasty procedure.

Implant pocket placement

The placement of implants is described in relation to the pectoralis major muscle.

- **Subglandular**- implant between the breast tissue and the pectoralis muscle. This position closely resembles the plane of normal breast tissue and is felt by many to achieve the most aesthetic results. The subglandular position in patients with thin soft-tissue coverage is most likely to show ripples or wrinkles of the underlying implant. Capsular contracture rates are also slightly higher with this approach
- **Subfascial**- the implant is placed in the subglandular position, but underneath the fascia of the pectoralis muscle. The benefits of this technique are debated, but proponents believe the thin vascularized fascia may help with coverage and sustaining positioning of the implant.
- **Subpectoral** ("dual plane") - the implant is placed underneath the pectoralis major muscle after releasing the inferior muscular attachments. As a result, the implant is partially beneath the pectoralis in the upper pole, while the lower half of the implant is in the subglandular plane. This is the most common technique in North America and achieves maximal upper implant coverage while allowing expansion of the lower pole. Capsular contracture rates have been lower after widespread adoption of this technique.
- **Submuscular**- the implant is placed below the pectoralis without release of the inferior origin of the muscle. Total muscular coverage may be achieved by releasing the lateral chest wall muscles (seratus and/or pectoralis minor) and sewn to the pectoralis major. This technique is most commonly used for maximal coverage of implants used in breast reconstruction.

Complications

Local complications that can occur with breast implants include post-operative bleeding (hematoma), fluid collections (seroma), surgical site infection, breast pain, alterations in nipple sensation, interference with breast feeding, visible wrinkling, asymmetric appearance, wound dehiscence (with potential implant exposure), thinning of the breast tissue, and synmastia (disruption of the natural plane between breasts).

The most common reasons cited for reoperation after breast augmentation are capsular contracture and dissatisfaction with size or appearance.

Rupture

Breast implants do not last a lifetime. When saline breast implants break, they often deflate quickly and can be easily removed. Prospective studies of saline-filled breast implants approved by FDA in May 2000 showed rupture/deflation rates of 3-5% at 3 years and 7-10% at 5 years for augmentation patients.[4] (http://www.fda.gov/cdrh/breastimplants/)

The recent FDA approval of silicone implants stipulates that the manufacturers inform women that the implants "are not lifetime devices" and that most recipients will need at least one additional surgery to replace or remove their implants. Rupture is one reason for reoperation. Among the causes of rupture are damage during implantation or other procedures, trauma to the chest, and the pressure of mammograms. [5] (http://www.fda.gov/cdrh/breastimplants/handbook2004/localcomplications.html#3) The age and design of the implant are also important factors in rupture, but estimating ruptures rates of contemporary devices has been difficult for a variety of reasons, particularly because implant designs have changed over time.

Another shortcoming of previous studies is that most relied on clinical exams to determine rupture rates. Research indicates that clinical exams alone are inadequate to rule out suspected rupture; according to implant makers, only 30% of ruptures are accurately detected by experienced plastic surgeons, compared to 86% detected by MRIs [19] For that reason, the FDA has concluded that MRIs are necessary to most accurately identify rupture prior to surgery and recommends an MRI at three years after implantation and then every two years thereafter for screening purposes. [6] (http://www.fda.gov/cdrh/pdf2/P020056d.pdf) . Other countries have not endorsed routine MRI screening, and taken the position that MRI be reserved only for cases involving suspected clinical rupture or to confirm mammographic or ultrasound studies suggesting rupture.[7] (http://www.hc-sc.gc.ca/dhp-mps/md-im/activit/sci-consult/implant-breast-mammaire/eapbi_rop_gceim_crd_2005-09-29_e.html)

In the first study using MRIs for women with silicone gel breast implants, the FDA found that after 11 years, most women had at least one ruptured implant, and the silicone was leaking outside of the capsule of 21% of the women in the study. [20] However that study included women whose implants dated from before 1990, and many of the implants were 2nd generation. MRI data from the US-FDA required "core" studies of contemporary implants has demonstrated low rupture rates (<2%) within the first 3-4 years after implantation for single lumen silicone implants, and will continue to be followed longitudinally to better characterize rupture rate.[8] (http://www.fda.gov/cdrh/breastimplants/labeling.html)

The only available literature with longer term available MRI data on single lumen 3rd/4th generation silicone implants comes from Europe and has reported silent rupture rates of at between 8% to 15% at or around a decade.[21] [22] [23]. This represented a 15-30% silent rupture risk for individual patients. The first series of MRI evaluation of the highly-cohesive (5th generation) gel implants suggests improved durability, with a rupture rate reported at 0.3% at a median of six years.[24]

When silicone implants break they rarely deflate, and the silicone from the implant can leak out into the intracapsular space around the implant. An intracapsular rupture can progress to outside of the capsule (extracapsular rupture), and when recognized, both conditions are generally agreed to indicate the need for removal of the implant. Extracapsular silicone has the potential to migrate, but most clinical complications have appeared to be limited to the breast and axillae [25] in the form of granulomas (inflammatory nodules) and axillary lymphadenopathy [26](enlarged lymph glands in the armpit area). [9] (http://www.fda.gov/cdrh/breastimplants/studies/birupture.html)

The specific risk and treatment of extracapsular silicone gel is still controversial. Plastic surgeons agree that it is difficult to remove, but there is disagreement about the health effects.

Capsular contracture

Capsules of tightly-woven collagen fibers form as an immune response around a foreign body (eg. breast implants, pacemakers, orthopedic joint prosthetics), tending to wall it off. Capsular contracture occurs when the capsule tightens and squeezes the implant. This contracture is a complication that can be very painful and distort the appearance of the implanted breast. The exact cause of contracture is not known. However, some factors include bacterial contamination, silicone rupture or leakage, and hematoma.Capsular contracture may happen again after this additional surgery.

Methods which have been successful for reducing capsular contracture rates include submuscular implant placement, using textured [27][28] or polyurethane-coated implants [29], limiting handling of the implants and skin contact prior to insertion [30] , and irrigation with triple-antibiotic solutions,[31]

Correction of capsular contracture may require surgical removal or release of the capsule or removal (and possible replacement) of the implant itself. Closed capsulotomy (disrupting the capsule via external manipulation), a once common maneuver for treating hard capsules, has been discouraged as it can facilitate implant rupture. Nonsurgical methods of treating capsules include external ultrasound [32], treatment with leukotriene pathway inhibitors (Accolate, Singulair) [33], and pulsed electromagnetic field therapy. [34]

Systemic illness and disease

Since the early 1990s, nearly a dozen comprehensive systemic reviews have been commissioned by various governments' health ministries to examine the alleged links between silicone gel breast implants and systemic diseases. A clear consensus has emerged from these independent scientific reviews that there is no clear evidence of a causal link between the implantation of silicones and connective tissue disease. The conclusions of these reviews are summarized:

Year	Country	Systematic Review Group	Conclusions
1991-1993	United Kingdom	Independent Expert Advisory Group (IEAG)	The IEAG concluded that there was no evidence of an increased risk of connective tissue disease in patients who had undergone silicone gel breast implantation and that there was no scientific case for changing practice or policy in the UK in respect of breast implantation
1996	USA	US Institute of Medicine (**IOM**) [35]	Not "sufficient evidence for an association of silicone gel- or saline-filled breast implants with defined connective tissue disease".
1996	France	Agence Nationale pour le Développement de l'Évaluation Médicale (**ANDEM**)[10] (http://laurent.benadiba.free.fr/SITE%20These/Analyse%20resultats.htm)	"Nous n'avons pas observé de connectivité ni d'autre pathologie auto-immune susceptible d'être directement ou indirectement induite par la présence d'un implant mammaire en particulier en gel de silicone..." (We did not observe connective tissue or other diseases to be directly or indirectly associated with (in particular) silicone gel breast implants)
1997	Australia	Australia's Therapeutic Devices Evaluation Committee review	"current high quality literature suggest that there is no association between breast implants and connective tissue disease-like syndromes (atypical connective tissue diseases)"[11] (http://www.tga.gov.au/docs/pdf/breasti4.pdf)

1998	Germany	Germany's Federal Institute for Medicine and Medical Products	concluded that "silicone breast implants neither cause auto-immune diseases nor rheumatic diseases and have no disadvantageous effects on pregnancy, breast feeding capability or the health of children who are breast fed. There is no scientific evidence for the existence of silicone allergy, silicone poisoning, atypical silicone diseases or a new silicone disease" [36]
2000	USA	Review request of the United States Federal Judiciary[37]	"no evidence of an association between...silicone-gel-filled breast implants specifically, and any of the individual CTDs, all definite CTDs combined, or other autoimmune or rheumatic conditions."
2000	European Union	European Committee on Quality Assurance & Medical Devices in Plastic Surgery (**EQUAM**)	"Additional medical studies have not demonstrated any association between silicone-gel filled breast implants and traditional auto-immune or connective tissue diseases, cancer, nor any other malignant disease....EQUAM continues to believe that there is no scientific evidence that silicone allergy, silicone intoxication, atypical disease or a 'new silicone disease' exists."[12] (http://www.secpre.org/pdf/equam.pdf)
2001	Great Britain	UK Independent Review Group (**UK-IRG**)	"there is no evidence of an association with an abnormal immune response or typical or atypical connective tissue diseases or syndromes"[13] (http://www.silicone-review.gov.uk/press_notice.htm)
2001	USA	Review for court appointed National Science Panel [38]	The panel evaluated both established and undifferentiated connective tissue diseases and concluded that there was no evidence of an association between breast implants and these CTDs.
2003	Spain	**STOA** Report to the European Parliament Petitions Committee	Regarding new scientific evidence, the currently available information shows that there is not solid evidence linking SBI to severe diseases (such as breast cancer or connective tissue diseases). [14] (http://www.eucomed.be/docs/STOA-SILICONE%20BREAST%20IMPLANT%20Study%20update-30May03.pdf)

Thousands of women have still claimed that they have become ill from their implants. Complaints include systemic fungal infections, neurological and rheumatological problems.

As studies have followed women with implants for a longer period of time, more information has been made available to assess these issues. A 2004 Danish study, reported that women who had breast implants for an average of 19 years were no more likely to report an excess number of rheumatic symptoms then control groups.[39] A large study of plastic surgery patients found a decreased standardized mortality ratio in both breast implant and other plastic surgery patients, but a relatively increased risk of lung cancer deaths in breast implant recipients compared to other forms of plastic surgery. The authors attributed this to differences in smoking rates.[40] Another large study of nearly 25,000 Canadian women with implants recently reported a 43 percent lower rate of breast cancer compared with the general population and a lower-than-average risk of developing cancer of any kind.[41]

A 2001 study on silicone gel breast implants reported an increase in fibromyalgia among women with extracapsular leakage, compared to women whose implants were not broken or leaking outside the capsule. [42]. This association has not been reproduced in a number of other studies, and the FDA has since concluded "the weight of the epidemiological evidence published in the literature does not support an association between fibromyalgia and breast implants." [15] (http://www.fda.gov/cdrh/breastimplants/handbook2004/diseases.html#1)

Platinum

Platinum is a catalyst used in the making of silicone implant polymer shells and other silicone devices used in medicine. The literature indicates that small amounts of platinum leaches (leaks) from these implants and is present in the surrounding tissue. The FDA reviewed the available studies from the medical literature on platinum and breast implants in 2002 and concluded there was little evidence suggesting toxicity from platinum in implant patients. [43]

In 2006, researchers published a controversial study that claimed to identify the previously undocumented presence of toxic platinum oxidative states *in vivo*. [44]. A letter from the editors of the publishing journal, *Analytical Chemistry*, subsequently expressed concern over the research's experimental design and urged the journal's readers to "use caution in evaluating the conclusions drawn in the paper."[16] (http://pubs.acs.org/cen/news/84/i31/8431notw5.html) The FDA reviewed this study and the existing literature, concluding that the body of existing research did not support their findings, and that the platinum in new implants is likely not ionized and therefore would not represent a significant risk to women. [17] (http://www.fda.gov/cdrh/breastimplants/platinum.html)

Concerns with breast cancer screening and treatment in patients with breast implants

The presence of radio-opaque breast implants may interfere with the sensitivity of screening mammography. Specialized radiographic techniques where the implant is manually displaced ("**Eklund views**") may improve this somewhat, but approximately 1/3 of the breast is still not adequately visualized with a resultant increase in false-negative mammograms.[45]A number of studies looking at breast cancers in women with implants have found no significant difference in stage of disease at time of diagnosis, and prognosis appears to be similar in both groups with augmented patients not a higher risk for subsequent cancer recurrence or death.[46][47] Conversely, the use of implants for reconstruction *after* mastectomy for breast cancer also appears not to have a negative affect on cancer-related mortality.[48]

An observation that patients with implants are more often diagnosed with palpable tumors (but not larger ones) suggest that tumors of equal size may be more easily palpated in augmented patients, and this may compensate somewhat for the potential impairment of mammography.[29] This palpability is due to thinning of the breast by compression, innately smaller breasts a priori, and that the implant serves as a base against which the mass may be differentiated.[49]

The presence of a breast implant does not influence the ability for breast conservation (lumpectomy) surgery to be offered for women who subsequently develop breast cancer, and does not interfere with delivery of external beam radiation (XRT) treatments that may be required. [50]Fibrosis of breast tissue after XRT is common and an increase in capsular contracture rates would be expected.

Repair or revision surgery

Regardless of the type of implant, it is likely that women with implants will need to have one or more additional surgeries (reoperations) over the course of their lives. The most common reasons for reoperations are cosmetic concerns and capsular contracture. Reoperation rates are more frequent in breast reconstruction cases, particularly when patients have received XRT.

It appears that reoperation rates can be improved dramatically in aesthetic surgery by more carefully matching individual patients' soft-tissue characteristics to the type and size of implants used. Using appropriate device selection and proper technique, reoperation rates at up to seven years follow up have been reported as low as 3% [51] [52]

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External links

- U.S. Food and Drug Administration (FDA) - breast implant page (http://www.fda.gov/cdrh/breastimplants/)
- FDA 2004 Consumer Booklet on Breast Implant Complications and Reoperations (http://www.fda.gov/cdrh/breastimplants/breast_implant_risks_brochure.html)
- U.K. Medicines & Health Care Products Regulatory Agency (MHRA) - breast implant page (http://www.mhra.gov.uk/home/idcplg?IdcService=SS_GET_PAGE&nodeId=225)
- 2006 European Union INTERNATIONAL COMMITTEE FOR QUALITY ASSURANCE,MEDICAL TECHNOLOGIES AND DEVICES IN PLASTIC SURGERY(IQUAM) Position Statement (http://www.plastische-chirurgie.at/content/other/news/articles/IQUAM_8-06%20.pdf)
- Basics of implant based breast reconstruction (E-medicine) (http://www.emedicine.com/plastic/topic134.htm)
- 2006 Alliance for Justice Report on History of Silicone Breast Implants (http://www.allianceforjustice.org/access/current_issues.html)
- 1999 Institute of Medicine (**IOM**) Report on Silicone Implants (http://www.nap.edu/catalog/9602.html)
- Summary of Silicone Implant Safety (E-medicine) (http://www.emedicine.com/plastic/topic500.htm)
- 2006 Report, The FDA, Breast Cancer Survivors, and Silicone Implants (http://www.center4research.org/pdf/ImplantReport2006.pdf)
- National Cancer Institute Booklet, Surgery Choices for Women with Early-Stage Breast Cancer (http://www.cancer.gov/cancertopics/breast-cancer-surgery-choices)
- Breast Implants: A Research and Regulatory Summary, 2006, National Research Center for Women and Families (http://www.center4research.org/bi-res-reg-sum.html)
- 2006 FDA-Required Labeling Information for Silicone Breast Implants (http://www.fda.gov/cdrh/breastimplants/labeling.html)

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