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Cutaneous complications associated with breast augmentation: A review

S. Chopra, MBBS, BSc, MRCS [a], D. Marucci, MBBS, BA, PhD, FRACS [b,*]

[a] Macquarie University Hospital, Sydney, Australia
[b] Division of Surgery, University of Sydney and St. George Hospital, University of New South Wales, Australia

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ABSTRACT

Breast augmentation is one of the most popular and safe cosmetic procedures performed by plastic surgeons worldwide. Although breast implants are available in a number of different materials, silicone-filled implants remain the most common type. However, prior to the development of breast implants, various materials were injected into the soft tissues of the breasts to increase breast volume, which caused cutaneous complications and disfigurement. This review details the history of breast augmentation, the current methods used in augmentation surgery, and associated cutaneous complications.

Introduction

Breast augmentation is the most popular cosmetic surgery performed worldwide, and nearly 300,000 women in 2016 underwent augmentation surgery in the United States alone (American Society of Plastic Surgeons, 2015). As early as the late 1800s, people experimented with injecting various substances, ranging from glass balls and rubber to liquid silicone and oil, in an attempt to enhance breast volume, often with disastrous effects that required mastectomy (Adams and Mallucci, 2012).

Since the development of the first silicone implant by Cronin and Gerow in 1961 (Maxwell and Gabriel, 2009), implant safety, durability, and feel have improved. However, reports are ongoing (mainly from Asia and South America) of inappropriate chemicals that continue to be injected into the breasts (Chasan, 2007; Hage et al., 2001; Narins and Beer, 2006).

More recently, fat grafting as a form of primary augmentation has been re-explored. It allows for patients' own lipoaspirate to be used to enlarge and contour the breasts (Coleman, 1995, 2004). Initially described by Czerny (1895), fat grafting only became more established in recent years by plastic surgeons, as more evidence suggests its safety with regard to both detection and recurrence of breast cancer (Groen et al., 2016).

The current authors focus on cutaneous complications associated with all described forms of breast augmentation surgery.

Injectable augmentation

The practice of using injectable material for breast augmentation is now rarely used in developed nations due to the high complication rates. However, some agents are still used in developing nations, and cutaneous complications can manifest years later.

Peters and Fornasier summarized the four main historical eras of injectable materials used for breast augmentation in their 2009 paper (Table 1).

Paraffin and other early examples

The first published report of paraffin injection was by Gersuny in 1899 (Gersuny, 1900), who injected paraffin into a patient's scrotum after a previous bilateral orchiectomy so that the patient could pass the army's mandatory physical examination. Once the case report was published, Gersuny and others focused on breast enhancement. The process entailed heating paraffin in specially designed hot water chambers surrounding the syringe and enabling the paraffin to form a liquid to ease injection of large volumes into the breast.

Initially, cosmesis was decent, and complications to the breast did not materialize until at least 5 to 10 years after the initial injection, including pulmonary embolism, migration, ulceration, fistulae,

* Corresponding Author.
E-mail address: damian.marucci@sydney.edu.au. (D. Marucci).

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Table 1
Four main historical eras of injectables (Adapted from Peters and Fornasier, 2009)

Chemical	Era
Paraffin	1899-1914
A plethora of materials	1915-1943
Liquid silicone	1944-1991
Hydrophilic polyacrylamide hydrogel	1988-present

infection, and necrosis, which frequently lead to breast amputation. After the disastrous results of paraffin, clinicians turned to a multitude of products, from ivory and glass balls to resins and glues, until the 1940s.

Silicone liquid

By the end of World War II, Japanese prostitutes were using industrial-grade liquid silicone extensively to augment their breasts in an attempt to attract U.S. servicemen, who preferred women with larger breasts (Peters and Fornasier, 2009). The silicone was initially used in pure form, but other substances such as vegetable oil were later added to increase local tissue response and reduce migration, especially when applied in large volumes (eg, to the buttocks or breasts; Mello et al., 2013). The Sakurai formula, as described in Japan, is the best known mixture to combine liquid silicone with olive oil (Chasan, 2007; Narins and Beer, 2006).

Local complications after industrial liquid silicone injections range from changes in color and consistency of the skin to intense inflammation with necrosis and ulceration. Fistulas and abscesses to the skin surface can also occur and lead to the elimination of the injected material and scar deformity (and Behar et al., 1993; Freitas et al., 2008; Rohrich and Potter, 2004).

The average time from the injection of silicone to the development of complications is 9 years (Christensen et al., 2005; Vinnik, 1978; Wilkie, 1977). Peters and Fornasier split the presentations of complications into two main types. With the first type, the patient usually presents with multiple and/or painful lumps (siliconomas) in the breasts that can occur as early as 2 years postinjection to 10 to 15 years later (Lai et al., 2005; Rohrich and Potter, 2004; Vinnik, 1978). Fine-needle aspiration cytology testing of these siliconomas shows vacuolated histiocytes, which is a sparse inflammatory component, and multinucleated giant cells (Dodd et al., 1993). The smaller, simple granulomas can be treated with localized resection only.

For the second type, patients present with more severe cutaneous side effects of skin inflammation and impending breakdown from siliconomas. As the silicone invades the dermis and epidermis of the overlying skin, the breast may show varying stages of skin circulatory problems, from fine telangiectasia to necrosis. Many patients also have a history of receiving multiple injections of cortisone in an attempt to decrease/delay the inflammatory reaction, which can further complicate the clinical picture. Once fistulae have developed, treatment is much more difficult, and extensive surgery is usually necessary to fully excise these areas.

Hydrophilic polyacrylamide hydrogel

Hydrophilic polyacrylamide hydrogel (HPAMG) is a substance that most accredited clinicians have probably not come across or used directly. HPAGM was developed in Ukraine in the late 1980s, and this injectable gel is still heavily used in China and Iran as a safe material for facial and breast augmentation (Wei, 2016). Until recently, HPAMG appeared to be ideal soft-tissue filler material due to its supposed relatively good physiological compatibility and steady physicochemical state (Guo and Zhou, 2004). HPAMG is injected blindly into the breast, and it is not uncommon for the material to infiltrate into the breast parenchyma rather than the retro-mammary plane.

Due to its failure to develop a true fibrous capsule and its encapsulation by thin fibrous tissue only (Christensen et al., 2003), HPAMG can commonly tract back up the injection site and cause severe cutaneous complications. Typically patients are injected with 150 to 200 mL of HPAMG for the augmentation. Complications can develop from several months to 3 years after injection and range from chemical migration to tissue necrosis and infection. Intraglandular injection will displace the breast lobules and, if injected in large amounts, may result in glandular atrophy and skin necrosis. Intrapectoral injections will split and dissect the muscle fibers, giving a pseudo-linguine sign on magnetic resonance imaging (MRI; Berg, 2006). The most commonly reported problems are skin induration (58.9%; Kasi et al., 2016) and chest pain (Wei, 2016).

As with most gels that are injected into the breast, surgical removal of all substance is difficult due to migration and local tissue reactions. Inoculated pools of the gels can interfere with breast cancer screening tools, and may cause long-term carcinogenic tissue changes. MRI is the most useful technique to help show the distribution of the injected augmentation materials, and delineate the tissue planes. Also, by varying the MRI sequence combinations, silicone, paraffin, autologous fat, and polyacrylamide gels can be differentiated by their differing signal intensities (Ebrahim et al., 2014).

Most case reports that have dealt with the severe complications of liquid augmentation suggest a skin-sparing mastectomy with or without muscle and delayed reconstruction as the safest form of treatment. In cases where skin necrosis and/or fistulae are significant, amputation of the breast is necessary with free-tissue reconstruction (Aoki et al., 1997).

Implants

There have been great advances in the development and safety of breast implants since Cronin and Gerow produced the first silicone breast prosthesis in 1961. However, silicone implants have a finite life span because they age and eventually fail (Rohrich et al., 1998). Rohrich et al. reported implant failure rates of 4% to 71% depending on the definition of implant failure, the population base, and the diagnostic method used. More recent industry reports have the incidence of rupture much lower at 1% to 4% (Spear et al., 2007), mainly due to the improvement in silicone gel and shell technology.

Implant rupture results in the release or migration of silicone into the surrounding tissues and can cause significant complications that are similar to those of liquid silicone as described (Adams and Mallucci, 2012; American Society of Plastic Surgeons, 2015). Once identified, ruptures are managed by explantation of the implants and a capsulectomy. Reaugmentation can be performed concomitantly if the patient wishes to remain augmented and the surrounding tissue quality is still sound. There are several case reports of siliconoma migration as far down as the vulva and lower legs (Jeng et al., 2005). To limit distal silicone migration after rupture, most new-generation implants have a more cohesive gel. If the siliconomas become too hard, painful, and large, they can be managed with a simple excision. However, much like liquid silicone, when there is more extensive cutaneous involvement that causes ulceration, necrosis, and fistula formation, treatment is much more complex and patients usually require a mastectomy.

Other rare cutaneous complications with implants

Sensory alteration to the breast, especially the nipple-areolar complex, can be a major concern to some women undergoing augmentation. Studies that investigated sensory and lactation changes

indicated that the risk was low (Lund et al., 2016; Nommsen-Rivers et al., 2010; Stuebe et al., 2014; von Sperling et al., 2011), and long-term sensory injury risk was 0.1% (range, 0.0%-0.3%; Lund et al., 2016). A 10-year cohort study of 4927 women who underwent augmentation with Allergan implants found that nipple paresthesia/hypersensitivity for inframammary fold (IMF) incisions was only 0.2% (95% confidence interval, 0.1%-0.3%), and there were no reported changes for women who had periareolar incisions (Lund et al., 2016). Other studies have also echoed these findings of a slightly higher risk with an IMF incision (Mofid et al., 2006; Slezak and Dellon, 1993).

Larger implants and smaller breasts have shown an increased association of postoperative sensory alterations (Stuebe et al., 2014). However, the sensory changes in the small minority of patients who experienced them seemed to completely resolve over time without medical intervention. There was no difference in incidence of lactation issues after augmentation compared with the reported rate in postpartum women who do not have breast implants (Lund et al., 2016; Nommsen-Rivers et al., 2010; Stuebe et al., 2014; von Sperling et al., 2011).

Striae

Striae distensae (SD), which are commonly known as stretch marks, occur when tension is applied too rapidly for the skin's ability to expand. SD is characterized by atrophic, linear, and parallel lesions that usually run perpendicular to the Langer's lines, which represent the direction of minimum extensibility (Osman et al., 2008; Zheng et al., 1985). Cohort studies place the risk of SD postaugmentation mammaplasty with implants between 4.6% and 7.06% (Basile et al., 2012; Valente et al., 2014).

A classification for the degree of SD after augmentation has also been proposed to aid in risk assessment (Fig. 1). A study of 538 patients by Valente et al. in 2015 associated the following factors to increased SD risk: Young age (<35 years), larger implant volumes (>300 mL), smoking status, and normal or low body mass index, but the use of oral contraceptive medications was found to be a protective factor (Valente et al., 2014). However, Basile et al. found in his cohort of nulliparous women that the use of oral contraceptive medications, high body mass index, and history of stretch marks were related to a higher incidence (Basile et al., 2012). Both studies concluded that young age was a factor and has been hypothesized to be related to skin stretching caused by microfibril damage to fibrilins, which in younger women may be more fragile and thus more susceptible to rupture (Elsaie et al., 2009; Maia et al., 2009). (See Figs. 2–4.)

Mondor's disease

Mondor's disease or thrombophlebitis of the thoracoepigastric system of veins is a benign and usually self-limiting disease that has been reported after breast augmentation. Mondor's disease commonly appears below the inframammary incision site as (occasionally painful) cordlike structures that are especially apparent when the arms are raised (Khan, 2009). Presentation is typically 2 to 3 weeks after augmentation and disappearance occurs 6 to 8 weeks postsurgery (Khan, 2008).

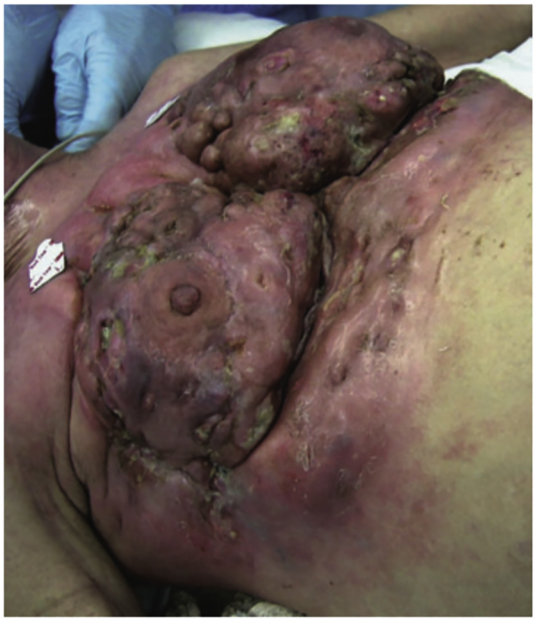

Fig. 2. Extensive cutaneous complications after silicone injections to the breasts

The cause of the disease is thought to be the division of the vertical superficial venous system when the incision occurs across the IMF, which leads to venous stasis and thrombus formation. Due to the majority of cases being transient and painless, a true incidence rate after augmentation is difficult to obtain, but the range in Khan's study was between 1.07% and 4.55% (Khan, 2008, 2009).

Cutaneous complications associated with lipofilling

Although initially reported in 1895 by Czerny, liposuction and the method of autologous fat grafting were not used to the breast for augmentation until 1987 (Bircoll, 1987; Bircoll and Novack, 1987). As more evidence is published on the oncologic safety of fat grafting to the breast, more plastic surgeons are now routinely using the method in breast reconstruction surgery (Al Sufyani et al., 2016; Gurunluoglu et al., 2013).

A vacuum-based, external, soft-tissue expander known as BRAVA (Brava, LLC; Miami, FL), has been successfully described to assist in the autologous fat grafting process (Coleman and Saboeiro, 2015; Khouri et al., 2012). Previously used as a nonsurgical breast enlargement system, the BRAVA is now particularly helpful in assisting

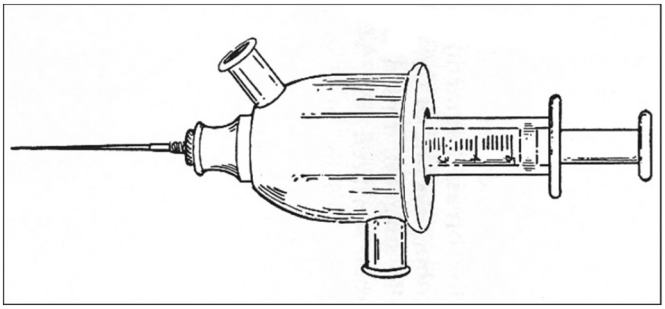

Fig. 1. Early warming chamber for liquefaction of paraffin before injection (Kolle, 1911)

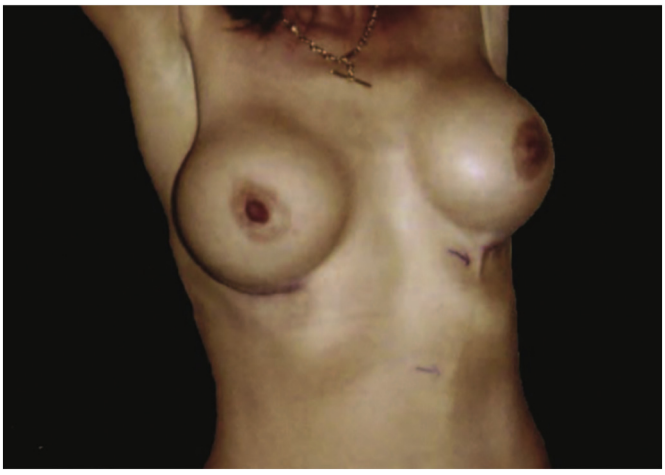

Fig. 3. Extensive Mondor disease of the left thoracoabdominal wall (Khan, 2009)

lipofilling augmentation in women who have very small breasts and/or very tight skin envelopes. The device enables a larger volume to be injected on the day of surgery and improves graft survival compared with more traditional lipofilling methods (Al Sufyani et al., 2016). The BRAVA technique achieves this by allowing the space to which fat can be added to enlarge through its vacuum, and it promotes angiogenesis to the existing tissue, which makes graft take more reliable (Al Sufyani et al., 2016; Gurunluoglu et al., 2013). However, a limitation is that patients are required to wear the device for approximately 10 to 12 hours per day for 4 weeks, both before and after the procedure.

Implant-related complications such as silicone leak/migration, rotation, seroma, or capsular contracture are avoided with fat grafting, which makes this method a low-risk and natural option for augmentation. However, the role of fat grafting in breast augmentation is limited because large volume changes through implants cannot be attained.

The total complication rate for fat grafting is between 8% and 15%, and lower than those reported after other reconstructive breast procedures such as implants and tissue flaps (Groen, 2016; Largo et al., 2014). Cutaneous complications associated with lipofilling can occur at both the breast and donor site, and range from erythema and cellulitis (0.8%) to cysts (6.9%) and abscess formation (6.9%). All reported cutaneous complications are minor, can be treated readily with either medical or surgical management, and can resolve over time.

Breast implant-associated anaplastic large cell lymphoma

Breast implant–associated anaplastic large cell lymphoma (biALCL) is a rare T-cell lymphoma in patients who underwent augmentation. To date, all patients with biALCL have had prolonged exposure to just textured implants (Brody et al., 2015; Miranda et al., 2014). biALCL is a rare condition for women undergoing augmentation, and many factors appear to be involved in its genesis rather than just exposure to implants. Typically, patients with biALCL present with only a seroma or mass (Loch-Wilkinson et al., 2017); however, reports exist of cutaneous manifestations, including subcutaneous nodules (Kim et al., 2011; Shahriari et al., 2017), erythematous skin eruptions or ulceration (Laurent et al., 2016), and indurated papules (Alcalá et al., 2016; Brody et al., 2015).

With the proper application of anti-infective strategies in the operating setting, biALCL risk can be significantly reduced (Shahriari et al., 2017). Patients diagnosed with biALCL have a favorable oncologic outcome after appropriate surgical management of the removal of the implant and total capsulectomy.

Conclusions

Although breast augmentation remains one of the most popular and safe procedures performed by plastic surgeons worldwide, cutaneous and soft-tissue complications are not uncommon. Clinicians need to be aware of all possible forms of augmentation, along with associated complications, so that a timely diagnosis can be made with appropriate management.

References

Adams Jr WP, Mallucci P. Breast augmentation. Plast Reconstr Surg 2012;130(4):597e–611.
Al Sufyani MA, Al Hargan AH, Al Shammari NA, Al Sufyani MA. Autologous fat transfer for breast augmentation: A review. Dermatol Surg 2016;42(11):1235–42.
Alcalá R, Llombart B, Lavernia J, Traves V, Guillén C, Sanmartín O. Skin involvement as the first manifestation of breast implant-associated anaplastic large cell lymphoma. J Cutan Pathol 2016;43(7):602–8.
American Society of Plastic Surgeons. 2015 cosmetic plastic surgery statistics [Internet]. [cited 2017 September 12]. Available from: https://www.plasticsurgery.org/news/plastic-surgery-statistics?sub=; 2015.

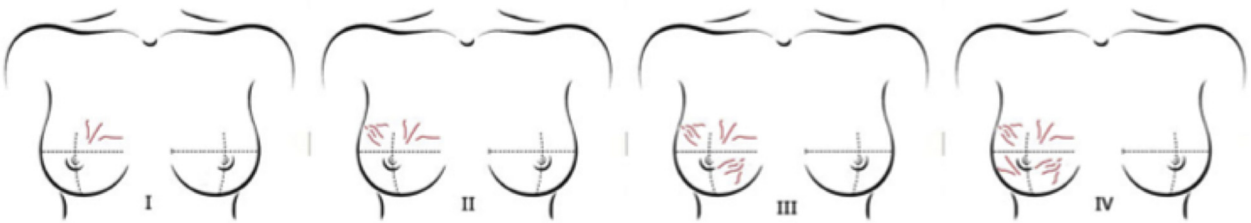

Fig. 4. Proposed striae classification by Basile et al. (2012)

Aoki R, Mitsuhashi K, Hyakusoku H. Immediate reaugmentation of the breasts using bilaterally divided TRAM flaps after removing injected silicone gel and granulomas. Aesthet Plast Surg 1997;21(4):276–9.
Basile FV, Basile AV, Basile AR. Striae distensae after breast augmentation. Aesthet Plast Surg 2012;36(4):894–900.
Behar TA, Anderson EE, Barwick WJ, Mohler JL. Sclerosing lipogranulomatosis: A case report of scrotal injection of automobile transmission fluid and literature review of subcutaneous injection of oils. Plast Reconstr Surg 1993;91(2):352–61.
Berg W. Diagnostic imaging. Breast. Post-operative imaging findingsUtah: Amirsys; 2006.
Bircoll M. Cosmetic breast augmentation utilizing autologous fat and liposuction techniques. Plast Reconstr Surg 1987;79:267–71.
Bircoll M, Novack BH. Autologous fat transplantation employing liposuction techniques. Ann Plast Surg 1987;18:327–9.
Brody GS, Deapen D, Taylor CR, Pinter-Brown L, House-Lightner SR, Andersen JS, et al. Anaplastic large cell lymphoma occurring in women with breast implants: Analysis of 173 cases. Plast Reconstr Surg 2015;135:695–705.
Chasan PE. The history of injectable silicone fluids for soft-tissue augmentation. Plast Reconstr Surg 2007;120(7):2034–40 discussion 2041–3.
Christensen L, Breiting V, Aasted A, Jorgensen A, Kebuladze I. Long-term effects of polyacrylamide hydrogel on human breast tissue. Plast Reconstr Surg 2003;111:1883–90.
Christensen L, Breiting V, Jansen M, Vuust J, Hogdall E. Adverse reactions to injectable soft tissue permanent fillers. Aesthet Plast Surg 2005;29:34–48.
Coleman SR. Long-term survival of fat transplants: Controlled demonstrations. Aesthet Plast Surg 1995;19:421e5.
Coleman SR. Structural fat grafting. St. Louis, Missouri: Quality Medical Publishing; 2004.
Coleman SR, Saboeiro AP. Primary breast augmentation with fat grafting. Clin Plast Surg 2015;42(3):301–6 vii.
Czerny V. Plastischer Erzats de Brustdruse durch ein Lipom. Zentralbl Chir 1895;27:72.
Dodd LG, Sneige N, Reece GP, Fornage B. Fine-needle aspiration cytology of silicone granulomas in the augmented breast. Diagn Cytopathol 1993;9:498–502.
Ebrahim L, Morrison D, Kop A, Taylor D. Breast augmentation with an unknown substance. BMJ Case Rep 2014.
Elsaie ML, Baumann LS, Elsaie LT. Striae distensae (stretch marks) and different modalities of therapy: An update. Dermatol Surg 2009;35:563–73.
Freitas RJ, Cammarosano MA, Rossi RHP, Bozola AR. Injeção ilícita de silicone líquido: Revisão de literatura a propósito de dois casos de necrose de mamas. Rev Bras Cir Plast 2008;23(1):53–7.
Gersuny R. Ueber eine subcutyane Prothese. Z Heilk 1900;30:1–5.
Groen JW, Negenborn VL, Twisk DJWR, Rizopoulos D, Ket JCF, Smit JM, et al. Autologous fat grafting in onco-plastic breast reconstruction: A systematic review on oncological and radiological safety, complications, volume retention and patient/surgeon satisfaction. J Plast Reconstr Aesthet Surg 2016;69(6):742–64.
Guo NQ, Zhou WD. Analysis of the complications induced by polyacrylamide hydrogel injection. Plast Reconstr Surg 2004;114:261–2.
Gurunluoglu R, Gurunluoglu A, Williams SA, Tebockhorst S. Current trends in breast reconstruction: Survey of American Society of Plastic Surgeons 2010. Ann Plast Surg 2013;70:103–10.
Hage JJ, Kanhai RC, Oen AL, van Diest PJ, Karim RB. The devastating outcome of massive subcutaneous injection of highly viscous fluids in male-to-female transsexuals. Plast Reconstr Surg 2001;107(3):734–41.
Jeng CJ, Ko ML, Wang TH, Huang SH. Vulvar siliconoma migrating from injected silicone breast augmentation. BJOG 2005;112(12):1659–60.
Kasi AD, Pergialiotis V, Perrea DN, Khunda A, Doumouchtsis SK. Polyacrylamide hydrogel (Bulkamid(R)) for stress urinary incontinence in women: A systematic review of the literature. Int Urogynecol J 2016;27:367–75.
Khan UD. Incidence of Mondor disease in breast augmentation: A retrospective study of 2052 breasts using inframammary incision. Plast Reconstr Surg 2008;122:88e–9.
Khan UD. Mondor disease: A case report and review of the literature. Aesthet Surg J 2009;29(3):209–12.
Khouri RK, Eisenmann-Klein M, Cardoso E, Cooley BC, Kacher D, Gombos E, et al. Brava and autologous fat transfer is a safe and effective breast augmentation alternative: Results of a 6-year, 81-patient, prospective multicenter study. Plast Reconstr Surg 2012;129:1173e87.
Kim B, Roth C, Chung KC, Young VL, van Busum K, Schnyer C, et al. Anaplastic large cell lymphoma and breast implants: A systematic review. Plast Reconstr Surg 2011;127:2141–50.
Kolle FS. Plastic and cosmetic surgery. New York, NY: D Appleton and Co.; 1911.
Lai CS, Lin TM, Lee SS, Yang CC, Lin SD. Surgical treatment of facial siliconoma involving the temporal area. Plast Reconstr Surg 2005;115:553–8.
Largo RD, Tchang LA, Mele V, Scherberich A, Harder Y, Wettstein R, et al. Efficacy, safety and complications of autologous fat grafting to healthy breast tissue: A systematic review. J Plast Reconstr Aesthet Surg 2014;67(4):437–48.
Laurent C, Delas A, Gaulard P, Haioun C, Moreau A, Xerri L, et al. Breast implant- associated anaplastic large cell lymphoma: Two distinct clinicopathological variants with different outcomes. Ann Oncol 2016;27(2):306–14.
Loch-Wilkinson A, Beath KJ, Knight RJW, Wessels WLF, Magnusson M, Papadopoulos T, 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(4):645–54.
Lund HG, Turkle J, Jewell ML, Murphy DK. Low risk of skin and nipple sensitivity and lactation issues after primary breast augmentation with form-stable silicone implants: Follow-Up in 4927 Subjects. Aesthet Surg J 2016;36(6):672–80.
Maia M, Marçon CR, Rodrigues SB, Aoki T. Striae distensae in pregnancy: Risk factors in primiparous women. An Bras Dermatol 2009;84:599–605.
Maxwell GP, Gabriel A. The evolution of breast implants. Clin Plast Surg 2009;36:1–13.
Mello DF, Gonçalves KC, Fraga MF, Perin LF, Helene Jr A. Local complications after industrial liquid silicone injection: Case series. Rev Col Bras Cir 2013;40(1):37–42.
Miranda RN, Aladily TN, Prince HM, Kanagal-Shamanna R, de Jong D, Fayad LE, et al. Breast implant- associated anaplastic large-cell lymphoma: Long-term follow-up of 60 patients. J Clin Oncol 2014;32:114–20.
Mofid MM, Klatsky SA, Singh NK, Nahabedian MY. Nipple-areola complex sensitivity after primary breast augmentation: A comparison of periareolar and inframammary incision approaches. Plast Reconstr Surg 2006;117(6):1694–8.
Narins RS, Beer K. Liquid injectable silicone: A review of its history, immunology, technical considerations, complications, and potential. Plast Reconstr Surg 2006;118(3 Suppl):77S–84S.
Nommsen-Rivers LA, Chantry CJ, Peerson JM, Cohen RJ, Dewey KG. Delayed onset of lactogenesis among first-time mothers is related to maternal obesity and factors associated with ineffective breastfeeding. Am J Clin Nutr 2010;92(3):574–84.
Osman H, Usta IM, Rubeiz N, Abu-Rustum R, Charara I, Nassar AH. Cocoa butter lotion for prevention of striae gravidarum: A double-blind, randomised and placebo-controlled trial. BJOG 2008;115(9):1138–42.
Peters W, fornasier V. Complications from injectable materials used for breast augmentation. Can J Plast Surg 2009;17(3):89–96.
Rohrich RJ, Adams Jr WP, Beran SJ, Rathakrishnan R, Griffin J, Robinson Jr JB, et al. An analysis of silicone gel-filled breast implants: Diagnosis and failure rates. Plast Reconstr Surg 1998;102:2304–8 discussion 2309.
Rohrich RJ, Potter JK. Liquid injectable silicone: Is there a role as a cosmetic soft-tissue filler? Plast Reconstr Surg 2004;113(4):1239–41.
Shahriari N, Ferenczi K, Heald PW. Breast implant-associated anaplastic large cell lymphoma: A review and assessment of cutaneous manifestations. Int J Womens Dermatol 2017;3(3):140–4.
Slezak S, Dellon AL. Quantitation of sensibility in giganto mastia and alteration following reduction mammaplasty. Plast Reconstr Surg 1993;91(7):1265–9.
Spear SL, Murphy DK, Slicton A, Walker PS, Inamed Silicone Breast Implant U.S. Study Group. Inamed silicone breast implant core study results at 6 years. Plast Reconstr Surg 2007;120:8S–16S discussion 17S–8.
von Sperling ML, Høimyr H, Finnerup K, Jensen TS, Finnerup NB. Persistent pain and sensory changes following cosmetic breast augmentation. Eur J Pain 2011;15(3):328–32.
Stuebe AM, Horton BJ, Chetwynd E, Watkins S, Grewen K, Meltzer-Brody S. Prevalence and risk factors for early, undesired weaning attributed to lactation dysfunction. J Women's Health 2014;23(5):404–12.
Valente DS, Zanella RK, Doncatto LF, Padoin AV. Incidence and risk factors of Striae Distensae following breast augmentation surgery: a cohort study. PLoS One 2014;9(5):e97493.
Vinnik CA. Silicone mastopathy. In: Owsley JQ, Peterson RA, editors. Symposium on Aesthetic Surgery of the Breast. St Louis, Missouri: The C. V. Mosby Company; 1978. p. 151–5.
Wei W. Treatment of complications from polyacrylamide hydrogel breast augmentation. Exp Ther Med 2016;12(1):173–6.
Wilkie TF. Late development of granuloma after liquid silicone injections. Plast Reconstr Surg 1977;60:179–88.
Zheng P, Lavker RM, Kligman AM. Anatomy of striae. Br J Dermatol 1985;112(2):185–93.