

Breast Implantation Rates in Israel: Is There a Change in Trend?

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ABSTRACT **Background:** Breast implant illness (BII) is a rising concern among many patients. Although not fully understood, a connection between silicone breast implants and systemic diseases may be present. This connection may influence the types of breast surgeries performed. **Objectives:** To evaluate changing trends in breast surgeries in Israel over time, with regard to implantation, explantation, and implant exchange surgeries. **Methods:** In this ecological study, we presented data from four private medical centers in Israel regarding the number of breast implant surgeries performed in the years 2018–2019. Data were collected bi-yearly. The types of surgeries included breast implantation, explantation, and breast implant exchange. **Results:** When we summed and compared the yearly data, we saw that the number of implantations in 2018 was 2267 (80.1% of breast implant procedures that year), and 1929 (68.9%) in 2019. The number of implant exchanges in 2018 and 2019 was 482 (17.0%) and 608 (21.7%), respectively. In 2018, 80 (2.8%) explantations were performed and 262 (9.4%) in 2019. **Conclusions:** There appears to be a trend in the rise of implant removal surgeries in addition to a decrease in breast implantations. One possible reason may be patient concerns of BII. Another reason may be the increased public interest and discussion about systemic effects of breast implants. More research is needed in this field to achieve better understanding of the phenomenon, the reasons behind it, and the possible solutions and ways of treatment.

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KEY WORDS: autoimmune/inflammatory syndrome induced by adjuvants (ASIA) syndrome, breast implant illness (BII), capsulectomy, explantation, silicone breast implants

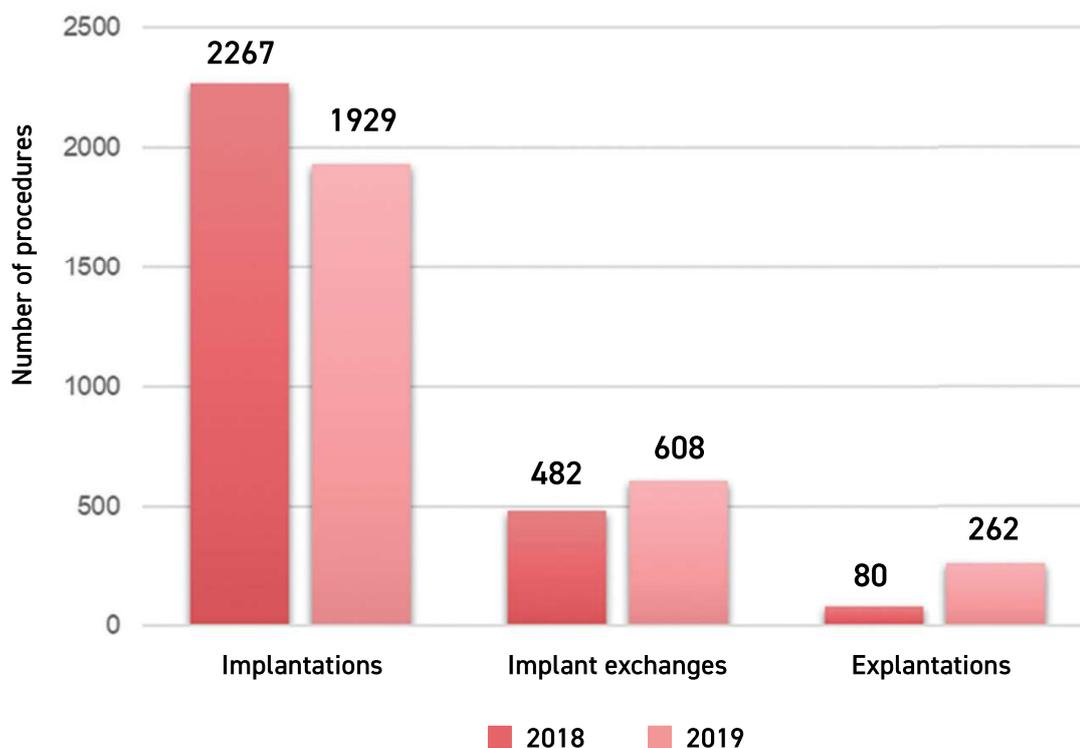
Breast augmentation surgery is one of the most popular plastic surgeries, and has been for many years. Breast implants are used for both aesthetic and reconstructive purposes [1]. Silicone breast implants were introduced in the 1960s, and have undergone many changes and improvements in their composition and structure since. Their general structure consists of an outer silicone elastomer shell and a filling of silicone gel. Over time, five generations of silicone implants have been developed.

The first generation had a thick envelope, which resulted in a high contracture rate. The second implant generation consisted of a thinner shell but encountered a problem of diffusion of microscopic silicone molecules into the space between the implant and the capsule. Third generation of silicone implants had a reduced gel bleed rate, but in 1992, due to rising concerns regarding the connection between silicone gel implants and autoimmune and rheumatic diseases, the U.S. Food and Drug Administration called for a moratorium that limited the use of these implants. After numerous studies proved no connection between the two, silicone implants were reintroduced to the American market in 2006, in addition to the development of fourth and fifth generations of implants [1,2].

Although no solid connection between silicone implants and systemic diseases was shown at the time, studies conducted by implant manufacturers after the reintroduction of silicone implants acknowledged that data on rare events and long-term outcomes were insufficient [3].

A few terms are used to describe these diseases connected with silicone implants. They include human adjuvant disease, silicone-induced human adjuvant disease, autoimmune/inflammatory syndrome induced by adjuvants (ASIA), and silicone implant incompatibility syndrome [3]. The assumption is that a substance that acts as an adjuvant stimulates the patient's immune system, innate and adaptive, in an exaggerated manner, and triggers a chain of biological processes that cause diseases in susceptible individuals. Reports have suggested that silicone induces a non-specific foreign body reaction, sometimes accompanied by the formation of autoimmune antibodies, with no clear association to autoimmune disease. It is possible that silicone acts as an environmental trigger to autoimmunity in a genetically predisposed person [4]. The range of symptoms reported by patients with breast implant illness (BII) is wide and may involve almost any organ system. Fatigue, cognitive impairment, arthralgias, myalgias, and dry eyes and mouth have been described as possibly being associated with silicone breast implants [5].

In a recent cross-sectional study of women with silicone breast implants, an association to autoimmune/rheumatic disorder was found, especially to Sjögren's syndrome, systemic sclerosis and sarcoidosis, but without evidence of a causal relationship [6,7]. In the past few years, some other rheumatologic

Figure 1. Number of yearly procedures by type

studies have shown relationship between the implants and such diseases, but have not yet shown any causal evidence, and some of them had methodological limitations that may have influenced the interpretation of their results [8].

Another limitation of the assessment of BII is the lack of standardization in diagnosis. Although ASIA syndrome has suggested diagnostic criteria, and certain rheumatologic diseases have specific symptoms and antibodies used for diagnosis, BII is often used as a nonspecific term to describe a broad spectrum of clinical presentations and complications related to breast implants [3]. A difficulty in accurately assessing the incidence of BII is the insufficient correlation between the actual incidence of symptoms and the total amount of breast implants inserted [3].

Social media influences and plays an important role in public opinion of plastic surgery [9,10]. Although patients gather abundant information from social media and may receive emotional support, data presented are not always accurate or well supported by scientific research. BII is a rising topic discussed on different platforms of social media.

In this study we assessed whether there was a change in tendency in Israel regarding breast implant surgeries, given the rising reports and social media attention to possible associations between breast implants and systemic disease.

PATIENTS AND METHODS

In this ecological study, we presented data from four private medical centers in Israel regarding the number of breast implant surgeries performed during the years 2018–2019. Data were collected bi-yearly. Patients were between the ages of 22 and 69 years at the time of surgery. The implants in use were manufactured by Mentor, Allergan, Sebbin, and Silimed. The types of surgeries included breast implantation, explantation, and breast implant exchange. The number of each type of surgery was reviewed during this period of time as was the change in proportions between the different types of procedures.

RESULTS

A total of 5628 breast implant surgeries were performed in the centers in years 2018 and 2019, with no significant difference in the total number of procedures between the two periods (2829 and 2799, respectively).

The data collected concerned three types of surgeries: breast implantation, explantation, and implant exchange. Summary of the number of procedures is presented in Table 1.

Table 1. Number of breast implant surgeries by type and year

	H1 2018	H2 2018	H1 2019	H2 2019
Implantations	1177	1090	1112	817
Implant exchanges	296	186	273	335
Explantations	44	36	76	186
Total	1517	1312	1461	1338

H1= first half of year, H2= second half of year

When we summed the data and calculated a yearly comparison, we saw that the number of implantations in 2018 was 2267 (80.1% of breast implant procedures that year), and 1929 (68.9%) in 2019. The number of implant exchanges in 2018 and 2019 was 482 (17.0%) and 608 (21.7%), respectively. In 2018, 80 (2.8%) explantations were performed, and this number reached 262 (9.4%) in 2019 [Figure 1].

DISCUSSION

BII has been a rising concern, although no established relationship between silicone breast implants and systemic diseases has been made.

Watad and colleagues [6,7,11] have studied this matter for many the years, conducting research on both Israeli population databases and analysis of international registries. In their studies, they showed that women with silicone breast implants had a higher chance of being diagnosed with an autoimmune/rheumatic illness compared to a matched group of women without implants, thus demonstrating an association between the two. More research groups in this field have shown similar outcomes [12], although many others have shown the contrary.

Discussing the relationship between silicone breast implants and systemic diseases encounters many challenges, such as the relatively small number of cases of rheumatic diseases in the population and the multifactorial nature of their etiology [6]. Furthermore, there is lack of standardization regarding the diagnosis of BII. In several studies the symptoms are self-reported by the patients; therefore, lacking an accurate medical diagnosis. Since this issue remains controversial, many centers in the world are currently investigating this phenomenon, including an ongoing study in the department of plastic surgery in Shamir Medical Center.

To achieve a better understanding of the topic and to correctly evaluate the link between implants and systemic disorders, more studies are needed to overcome the methodological issues of currently available research. In addition, the demonstration of a biologic mechanism explaining the association is needed.

Although no causal effect has been shown between implants and systemic symptoms, a possible trend of implant removal without clear medical indication is beginning to happen. In our study, we observed a decrease in the number of breast implant

insertions over the course of 2 years, along with a growth in the number of implant removal surgeries. Implant exchange surgeries also show a rise, although much more moderate.

It is important to emphasize that our study was conducted in the years 2018–2019, before the coronavirus disease-2019 (COVID-19) pandemic. Surprisingly, although the total number of surgical procedures decreased during this period, and many patients refrained from seeking non-urgent medical care, still there was a relatively high number of patients requesting implant removal from the plastic surgery department at Shamir Medical Center. This trend may show the high motivation of the patients to remove their implants. We also noticed that requests for implant removal came not only from patients who underwent augmentation for aesthetic purposes, but also from patients who underwent reconstructive surgery due to oncologic reasons.

Increased motivation for implant removal may have several explanations. First, it may be due to the physical and emotional distress these patients encounter as a result of their symptoms. Second, there seems to be a high level of influence on public opinion on this topic from the media. The issue of BII was widely discussed in Israeli media, including radio shows, television, and, the internet. The internet has been a major source for medical information, and some studies even showed that there is a difference in medical information consumption between men and women. One of the studies showed that women were more likely to use the internet for health-related searches compared with men. Also, women in this study were found to be well-informed patients [13]. Based on those findings, it is not surprising that Facebook groups discussing silicone implant implications and their removal are followed by thousands of members and include hundreds of posts each month, and these numbers only represent Hebrew language discussions. In addition, we looked at Israeli websites offering medical information and advice by medical professionals. On one of these websites, Infomed, there is a medical forum concentrating on breast augmentation and mammoplasty, currently run by a senior author of this article. A search in this forum demonstrated a rise in patient concern regarding BII. While leading topics in the past were peri-operative care, scarring, and differences between different types of surgeries, circa 2016 a change started to take place, which increasing in 2018. Many of the current questions addressed

systemic symptoms in patients with implants, the importance of en bloc capsulectomy, and concerns regarding breast implant associated anaplastic large cell lymphoma (BIA-ALCL). It is important to note that although there is a risk of patients with breast implants developing BIA-ALCL, most of which were described in textured implants, the majority were of a specific type that has been recalled from the market by the manufacturer [14]. There is an established protocol for the evaluation and diagnosis of BIA-ALCL in suspected cases [15], and the total number of confirmed cases worldwide accounts for 573 to date [16], with only 4 cases in Israel (as of 2018) [17].

As to the question of en bloc capsulectomy, which is the concern of many patients, the answer is complex. En bloc capsulectomy, a term that originates in oncologic surgery, is a common request of explantation candidates. In the context of explantation surgeries due to concern of BII, the procedure describes the removal of an implant with its entire intact capsule. In this non-oncologic context, it may be discussed as partial versus complete capsulectomy (with or without intact capsule) [18]. Some claim that the term *en bloc* in this non-oncologic context is misleading, wrong, and needs to be re-defined [19]. When excluding BIA-ALCL patients, the necessity and benefit of capsule removal remains debated among surgeons. Some advise against capsule removal, some suggest removing only a severely contracted anterior capsule, and some perform a total capsulectomy. Physicians should not forget the challenges and risks of this procedure, including pain, hematoma, and pneumothorax, in addition to possible cosmetic impact [18].

The full removal of the implant capsule is sometimes requested by patients who underwent implantation for reconstructive reasons rather than aesthetic. These patients often have less support of soft tissue envelope, and performing a more radical surgery in these cases may result in worse cosmetic outcomes. According to current literature, true en bloc capsulectomy should be reserved for BIA-ALCL patients, while performing this procedure in other cases increases morbidity without clear indication. With regard to BII, it is not known whether the implant, capsule, or both are responsible, or perhaps none of them are. There are no known systemic benefits of capsulectomy, and removal of the capsule has not shown a consistent remission of the disease [20]. Recent studies show improvement of systemic symptoms after implant removal with a complete capsulectomy [21], but they are limited to self-reported symptoms rather than diagnosed diseases and have several methodological limitations. Other studies that showed symptom improvement after explantation were also based on patient self-assessment, while improvement in patients with established rheumatic disease was achieved after a combination of surgery with immunosuppressive therapy [22]. Current data are inconclusive with regard to the benefit of explantation and complete capsulectomy as a solution for systemic symptoms.

Another issue that arises from the explantation trend is the

financial coverage of these surgeries. At present time, health maintenance organizations only cover implant removal/exchange in cases of proven pathology such as capsular contracture or implant rupture. They do not cover the expenses of procedures related to BII, due to lack of medical evidence supporting the necessity. In such situations, patients who want to remove their breast implants are compelled to turn to private medical services, which are more expensive. Not all patients can afford those fees, and this matter should be considered. In the light of increasing awareness of the possibility of the relationship between implants and systemic symptoms, a special committee was established at Shamir Medical Center. This committee combines the assessment of both rheumatologists and plastic surgeons and in some cases recommends performing explantation surgeries as part of the public health care system.

It is important to remember that any medical intervention, minor or major, carries potential risks in addition to its benefits. Thus, it is crucial to understand that while breast implants have known complications that require removal or exchange, such as implant rupture, capsular contracture, implant wrinkling, or BIA-ALCL, performing these procedures without a clear medical indication, may put the patient under unnecessary risk.

We suggest that to better characterize and understand the phenomenon of BII, studies should be conducted in several directions. First, there is a need to describe the extent of the phenomenon in larger studies to have a more comprehensive assessment. Second, a standardization of symptoms and thorough follow-up of affected individuals is needed. In addition, a more basic biologic study is required to better describe and understand the illness, and conclude in a more definitive way whether a causal connection exists between silicone implants and systemic disease.

In this way, we will have a more solid basis to our treatment and follow-up strategies, as well as possible better patient selection for different procedures.

LIMITATIONS

This ecological study included only four private medical centers in Israel, and data were collected over the relatively short period of two years. We did not collect data on the specific type of implant used in the primary surgery. Thus, our study can offer only a small sample describing the phenomenon. More extensive research is needed to fully assess the trend.

CONCLUSIONS

In our study, we saw hints of an increase in implant removal surgeries, as well as a decrease in implantations. We assume that one of the reasons for this observation is the increasing interest and public discussion of possible effects of breast implants on general health. We strongly believe that much more research is needed in this field to reach proper conclusions on this topic to give our patients the most accurate information and the best treatment possible.

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References

1. Maxwell GP, Gabriel A. The evolution of breast implants. *Plast Reconstr Surg* 2014; 134 (1 Suppl): 12S-7S.
2. Cole NM. Consequences of the U.S. Food and Drug Administration-Directed Moratorium on Silicone Gel Breast Implants: 1992 to 2006. *Plast Reconstr Surg* 2018; 141 (5): 1137-1141.
3. Magnusson MR, Cooter RD, Rakhorst H, McGuire PA, Adams WP Jr, Deva AK. Breast implant illness: a way forward. *Plast Reconstr Surg* 2019; 143 (3S A review of breast implant-associated anaplastic large cell lymphoma): 74S-81S.
4. Perricone C, Colafrancesco S, Mazor RD, Soriano A, Agmon-Levin N, Shoenfeld Y. Autoimmune/inflammatory syndrome induced by adjuvants (ASIA) 2013: Unveiling the pathogenic, clinical and diagnostic aspects. *J Autoimmun* 2013; 47: 1-16.
5. Cohen Tervaert JW, Colaris MJ, van der Hulst RR. Silicone breast implants and autoimmune rheumatic diseases: myth or reality. *Curr Opin Rheumatol* 2017; 29 (4): 348-354.
6. Watad A, Rosenberg V, Tiosano S, et al. Silicone breast implants and the risk of autoimmune/rheumatic disorders: a real-world analysis. *Int J Epidemiol* 2018; 47 (6): 1846-1854.
7. Watad A, Bragazzi NL, McGonagle D, et al. Autoimmune/inflammatory syndrome induced by adjuvants (ASIA) demonstrates distinct autoimmune and autoinflammatory disease associations according to the adjuvant subtype: Insights from an analysis of 500 cases. *Clin Immunol* 2019; 203: 1-8.
8. Coroneos CJ, Selber JC, Offodile AC 2nd, Butler CE, Clemens MW. US FDA Breast Implant Postapproval Studies: Long-term Outcomes in 99,993 Patients. *Ann Surg* 2019; 269 (1): 30-36.
9. Montemurro P, Porcnik A, Hedén P, Otte M. The influence of social media and easily accessible online information on the aesthetic plastic surgery practice: literature review and our own experience. *Aesthetic Plast Surg* 2015; 39 (2): 270-277.
10. Tang SYQ, Israel JS, Afifi AM. Breast implant illness: symptoms, patient concerns, and the power of social media. *Plast Reconstr Surg* 2017 Nov; 140 (5): 765e-766e.
11. Watad A, Bragazzi NL, Amital H, Shoenfeld Y. Hyperstimulation of adaptive immunity as the common pathway for silicone breast implants, autoimmunity, and lymphoma of the breast. *IMAJ* 2019; 21 (8): 517-519.
12. Fenoglio R, Cecchi I, Roccatello D. ASIA syndrome following breast implant placement. *IMAJ* 2018; 20 (11): 714-716.
13. Bidmon S, Terlutter R. Gender Differences in Searching for Health Information on the Internet and the Virtual Patient-Physician Relationship in Germany: Exploratory Results on How Men and Women Differ and Why. *J Med Internet Res* 2015; 17 (6): e156. Published 2015 Jun 22.
14. Doren EL, Miranda RN, Selber JC, et al. U.S. Epidemiology of Breast Implant-Associated Anaplastic Large Cell Lymphoma. *Plast Reconstr Surg* 2017; 139 (5): 1042-1050.
15. Clemens MW, Jacobsen ED, Horwitz SM. 2019 NCCN Consensus Guidelines on the Diagnosis and Treatment of Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL). *Aesthet Surg J* 2019; 39 (Suppl_1): S3-S13.
16. U.S. Food and Drug Administration. Questions and Answers about Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) [Available from <https://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/BreastImplants/ucm239995.htm>]. [Accessed October 2020].
17. Ben Naftali Y, Barnea Y, Clemens MW, Bar-Meir E. How Common Is Breast Implant-Associated Anaplastic Large Cell Lymphoma? First Four Cases in Israel. *IMAJ* 2019; 21 (8): 512-515.
18. Johal KS, Floyd D. To bloc or not to bloc: challenges in the management of patients requesting "en-bloc capsulectomy". *Aesthet Surg J* 2020; 40 (9): NP561-NP563.
19. Gerzenshtein J. The dishonesty of referring to total intact capsulectomy as "en bloc" resection or capsulectomy. *Plast Reconstr Surg* 2020; 145 (1): 227e-228e.
20. Swanson E. Evaluating the Necessity of Capsulectomy in Cases of Textured Breast Implant Replacement. *Ann Plast Surg* 2020 Dec; 85 (6): 691-698.
21. Wee CE, Younis J, Isbester K, et al. Understanding breast implant illness, before and after explantation: a patient-reported outcomes study. *Ann Plast Surg* 2020; 85 (S1 Suppl 1): S82-S86.
22. de Boer M, Colaris M, van der Hulst RRWJ, Cohen Tervaert JW. Is explantation of silicone breast implants useful in patients with complaints? *Immunol Res* 2017; 65 (1): 25-36.

Capsule

Immunogenicity and safety of the CoronaVac inactivated vaccine in patients with autoimmune rheumatic diseases: a phase 4 trial

CoronaVac, an inactivated SARS-CoV-2 vaccine, has been approved for emergency use in several countries. However, its immunogenicity in immunocompromised individuals has not been well established. **Medeiros-Ribeiro** and colleagues initiated a prospective phase 4 controlled trial (no. NCT04754698, CoronavRheum) in 910 adults with autoimmune rheumatic diseases (ARD) and 182 age- and sex-frequency-matched healthy adults (control group, CG), who received two doses of CoronaVac. The primary outcomes were reduction of $\geq 15\%$ in both anti-SARS-CoV-2 IgG seroconversion (SC) and neutralizing antibody (NAb) positivity 6 weeks (day 69) after the second dose in the ARD group compared with that in the CG. Secondary outcomes were IgG SC and NAb positivity at day 28, IgG titers and neutralizing activity at day 28, and day 69 and vaccine safety. Pre-

specified endpoints were met, with lower anti-SARS-Cov-2 IgG SC (70.4 vs. 95.5%, $P < 0.001$) and NAb positivity (56.3 vs. 79.3%, $P < 0.001$) at day 69 in the ARD group than in the CG. Moreover, IgG titers (12.1 vs. 29.7, $P < 0.001$) and median neutralization activity (58.7 versus 64.5%, $P = 0.013$) were also lower at day 69 in patients with ARD. At day 28, patients with ARD presented with lower IgG frequency (18.7 vs. 34.6%, $P < 0.001$) and NAb positivity (20.6 versus 36.3%, $P < 0.001$) than that of the CG. There were no moderate/severe adverse events. These data support the use of CoronaVac in patients with ARD, suggesting reduced but acceptable short-term immunogenicity. The trial is still ongoing to evaluate the long-term effectiveness/immunogenicity.

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