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Autoimmune/inflammatory syndrome induced by adjuvants (ASIA) in plastic surgery: Evaluation of the relationship between breast implants and autoimmune diseases using immunological markers

Síndrome autoimune/inflamatória induzida por adjuvantes (ASIA) em cirurgia plástica: Avaliação da relação entre implantes mamários e doenças autoimunes por meio de marcadores imunológicos

Síndrome autoinmune/inflamatoria inducida por adyuvantes (ASIA) en cirugía plástica: Evaluación de la relación entre los implantes mamarios y las enfermedades autoinmunes mediante marcadores inmunológicos

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Abstract
The adjuvant-induced autoimmune-inflammatory syndrome (ASIA) has attracted increasing attention in the medical field, especially among patients undergoing plastic surgery procedures, such as breast implant placement. This study aims to understand the relationship between breast implants and ASIA syndrome, focusing on the study of immunological markers that may serve as early indicators of the condition. The methodology consists of an integrative literature review, utilizing the PubMED and Cochrane Library databases, with rigorous inclusion criteria that considered the methodological quality of the studies. The results indicate that the relationship between symptoms and breast implants is controversial, highlighting the need for more in-depth studies on the immune mechanisms involved. Additionally, the importance of implant removal in selected cases is emphasized, along with personalized medicine as an effective approach in managing the syndrome. In conclusion, early identification of immunological markers is essential for more appropriate interventions, aiming not only to enhance diagnosis but also to improve the quality of life for patients and mitigate long-term associated risks.
Keywords: Autoantibodies; Autoimmune diseases; Immunological markers; Citokines.

Resumo

A síndrome autoimune-inflamatória induzida por adjuvante (ASIA) tem atraído atenção crescente na área médica, especialmente em pacientes submetidos a procedimentos de cirurgia plástica, como a colocação de implantes mamários. Este estudo tem como objetivo compreender a relação entre implantes mamários e a síndrome de ASIA, focando no estudo sobre marcadores imunológicos que possam servir como indicadores precoces da condição. A metodologia consiste em uma revisão integrativa da literatura, utilizando as bases de dados PubMED e Cochrane Library, com critérios de inclusão rigorosos que consideraram a qualidade metodológica dos estudos. Os resultados indicam que a relação entre os sintomas e os implantes mamários é controversa, com a necessidade de estudos mais aprofundados sobre os mecanismos imunológicos envolvidos. Ainda, destaca-se a importância da remoção dos implantes em casos selecionados, além da medicina personalizada como uma abordagem eficaz no manejo da síndrome. Em conclusão, é essencial a identificação precoce dos marcadores imunológicos para intervenções mais adequadas, visando não apenas o aprimoramento do diagnóstico, mas também a melhoria da qualidade de vida dos pacientes e a mitigação dos riscos associados a longo prazo.

Palavras-chave: Autoanticorpos. Doenças autoimunes; Marcadores imunológicos; Citocinas.

Resumen

El síndrome autoinmune/inflamatorio inducido por adyuvantes (ASIA) ha despertado un creciente interés en el ámbito médico, especialmente entre los pacientes sometidos a procedimientos de cirugía plástica, como la colocación de implantes mamarios. Este estudio tiene como objetivo comprender la relación entre los implantes mamarios y el síndrome ASIA, con énfasis en el análisis de marcadores inmunológicos que puedan actuar como indicadores precoeces de esta condición. La metodología consiste en una revisión de la literatura, utilizando las bases de datos PubMED y Cochrane Library, con criterios rigurosos de inclusión que consideraron la calidad metodológica de los estudios. Los resultados indican que la relación entre los síntomas y los implantes mamarios es controvertida, lo que resalta la necesidad de estudios más profundos sobre los mecanismos inmunológicos implicados. Además, se enfatiza la importancia de la retirada de los implantes en casos seleccionados, así como la medicina personalizada como enfoque eficaz para el manejo del síndrome. En conclusión, la identificación precoz de marcadores inmunológicos es esencial para intervenciones más adecuadas, con el objetivo de mejorar tanto el diagnóstico como la calidad de vida de los pacientes y reducir los riesgos a largo plazo.

Palabras clave: Autoanticuerpos; Enfermedades autoinmunes; Marcadores inmunológicos; Citocinas.

1. Introduction

Autoimmune/Inflammatory Syndrome Induced by Adjuvants (ASIA) is an emerging phenomenon that has garnered increasing attention in the medical field, especially among patients undergoing plastic surgery procedures, such as breast implant placement (Henderson et al., 2019). Characterized by an exacerbated immune response that can lead to the development of autoimmune diseases, ASIA is associated with the use of adjuvants, such as materials found in breast implants (Shoenfeld et al., 2020). Furthermore, according to Matas et al. (2021), the inflammatory and autoimmune response triggered by these devices may lead to the development of conditions such as arthritis, lupus, and other autoimmune diseases.

The growing use of breast implants in plastic surgery has raised concerns about potential long-term health risks, despite their increasing popularity. Although many patients do not experience serious complications, a significant number have reported systemic symptoms, such as chronic fatigue, joint pain, and skin rashes, which may be indicative of ASIA syndrome (Henderson et al., 2019). The relationship between these symptoms and breast implants remains a controversial topic, with a clear need for further studies on the underlying immunological mechanisms (Wang et al., 2020).

Diagnosing ASIA syndrome in patients with breast implants is challenging, as its symptoms often resemble those of other autoimmune diseases and may not be immediately recognized as being caused by a medical device (López et al., 2021). Additionally, the search for specific immunological markers that could serve as early indicators of this syndrome is still ongoing. In this context, biomarkers that can correlate the presence of breast implants with immunological and autoimmune changes are essential for the development of more effective diagnostic protocols (Talarico et al., 2020).

Regarding treatment, the removal of breast implants has shown benefits in certain cases, alleviating symptoms related to ASIA syndrome. However, the therapeutic approach depends on the severity of the symptoms and the confirmed relationship between the implants and autoimmune diseases (Zhao et al., 2021). In this regard, personalized medicine, which

takes into account the individuality of each patient and their specific immunological profile, may be an effective strategy for managing patients with this condition (Ruggieri et al., 2021).

According to Perricone et al. (2021), their studies focus on the analysis of immunological markers such as autoantibodies and inflammatory cytokines (ANA, anti-Ro, anti-La, anti-dsDNA, anti-Scl-70, cyclic citrullinated peptide antibody, anticardiolipin, IgM rheumatoid factor, and specific HLA alleles), with the aim of elucidating the pathogenesis of ASIA syndrome in patients with breast implants. Early identification of these markers may allow for more effective interventions and prevent progression to more severe autoimmune diseases. Moreover, understanding the immune pathways involved is crucial for developing targeted therapies that can mitigate the adverse effects of ASIA in patients undergoing plastic surgery (Sato et al., 2020).

Therefore, the objective of this study is to understand the relationship between breast implants and ASIA syndrome, with a focus on the study of immunological markers that may serve as early indicators of the condition, through a literature review on the subject. Thus, the research will serve as a means to clarify how these findings will contribute to improving diagnosis and developing personalized treatments, aiming to enhance patients' quality of life and minimize long-term risks.

2. Methodology

The present study is quantitative with the number of articles selected and quantitative about the discussions held (Lakatos & Marconi, 2021; Pereira et al., 2018). It's an integrative literature review (Crossetti, 2012; Botelho, Cunha & Macedo, 2011) that used the PubMED and Cochrane Library databases to search for the theoretical framework using the descriptors and Boolean operators: "breast implants" and, "autoimmune diseases" and "ASIA". The search was also conducted in the languages selected as inclusion criteria. Filters applied included the last five years (2020 to 2025), free full-text articles, English and Portuguese languages, and selected types of texts: clinical trial, randomized controlled trial, systematic review, and meta-analysis. The search was conducted in March 2025.

The guiding research question for this study was: "What is the relationship between breast implants and ASIA syndrome?"

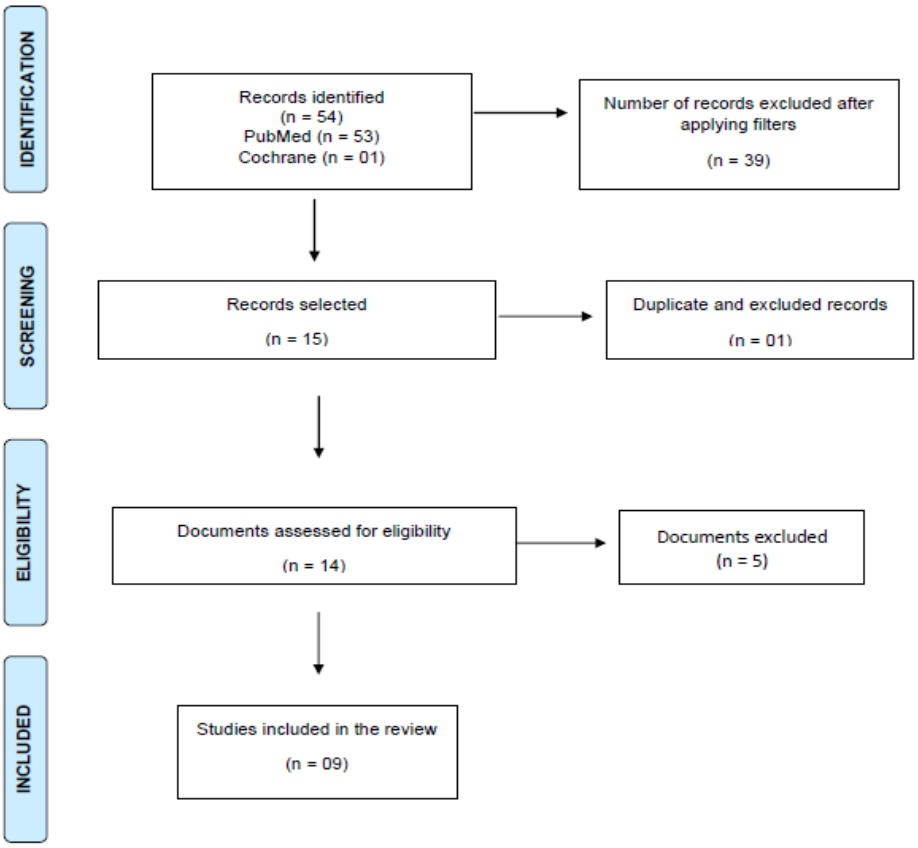
The inclusion criteria established the selection of studies that addressed ASIA Syndrome as the main condition, with an emphasis on the impact of this syndrome on overall health, particularly the relationship between breast implants and the development or worsening of autoimmune diseases. The study's objective had to be clearly related to the association between breast implants and the modulation of the immune system, resulting in changes in immunological parameters and the risk of autoimmune diseases. Furthermore, the methodological quality of the studies was considered, assessed based on research design, sampling, and data collection instruments.

Additionally, the Qualis classification of the journal was verified. This system ranks scientific journals based on criteria such as impact, editorial quality, indexing, and relevance, using the evaluation from the Coordination for the Improvement of Higher Education Personnel (CAPES). Verifying the Qualis of the journals where the articles were published is essential to ensure that the sources used are of high quality, thereby strengthening the credibility and robustness of the research (CAPES, 2023).

Studies whose main focus was not on ASIA syndrome or the relationship between breast implants and autoimmune diseases were excluded, even if they addressed related aspects such as inflammatory or autoimmune diseases not associated with implants. Studies that prioritized other conditions, such as infectious or metabolic diseases, were also excluded, as well as articles that did not follow the established search criteria. Duplicate articles and those with restricted or paid access were excluded to ensure the accessibility of the studies. Case reports and studies with low methodological evidence, such as small sample sizes or flaws in variable control, were also discarded.

The results found through the search are presented in Flowchart 1, showing the respective number of studies included and excluded after reading the selected articles.

Figure 1 - Description of the article selection process.



Source: Authors (2025). Adapted from the PRISMA flowchart (2020).

3. Results and Discussions

Below, Table 1 presents the articles selected according to the methodology:

Table 1 - Articles selected according to methodology.

Author/ year	Title	Qualis (CAPES)	Methodology	Main results
Tervaert et al. (2023)	"Autoimmune/ inflammatory syndrome induced by adjuvants (ASIA) in 2023"	A1	Systematic review	A systematic review indicates that the Autoimmune-Inflammatory Syndrome Induced by Adjuvants (ASIA) can be triggered by exposure to various adjuvants, including vaccines and implants. Notably, patients often experience symptom improvement following the removal of these adjuvants. Recent studies have identified additional factors associated with dysautonomia in ASIA, such as non-classical autoantibodies and small fiber neuropathy.

Woźniak-Roszkowska et al. (2020)	"Autoimmune syndrome induced by adjuvants after breast enhancement with polyacrylamide hydrogel: a study in Poland"	B2	Observational clinical study	The study found that 50% of patients met diagnostic criteria for ASIA syndrome. Removal of the hydrogel led to improvement or complete resolution of symptoms in many cases.
Simeonova et al. (2023)	"Takayasu arteritis associated with autoimmune/inflammatory syndrome induced by adjuvants: a case-based review"	A2	Case study	The article describes a case of Takayasu arteritis that developed in an individual one year after the placement of silicone breast implants. The research suggests that exposure to adjuvants may trigger or worsen autoimmune diseases such as Takayasu arteritis.
Yousfi et al. (2025)	"Autoimmune/inflammatory syndrome induced by adjuvants (ASIA) after silicone breast implants"	B3	Case report	The study reports a case in which a 35-year-old woman presented with inflammatory joint pain and fatigue after insertion of silicone breast implants. Symptoms improved significantly after treatment with corticosteroids, leading to the diagnosis of ASIA.
Van Assche et al. (2022)	"Progressive sensory ataxia and breast implant rupture, an uncommon presentation of a debated concept: a case report"	B2	Case study	The study describes that the patient presented sensory ganglionopathy as an initial symptom of Sjögren's Syndrome, associated with a silicone leak from a breast implant. After removal of the implant and immunosuppressive therapy, there was stabilization of the symptoms.
Shoenfeld et al. (2023)	"Silicone Breast Illness: A Review of Autoimmune Inflammatory Syndrome Induced by Adjuvant"	B1	Narrative review	The study found a significant increase in the risk of autoimmune diseases among women with silicone implants. In addition, it identified significant changes in autoantibody titers against autonomic nervous system antigens in symptomatic women.
Shoenfeld et al. (2020)	"Autoimmune/Inflammatory Syndrome Induced by Adjuvants (ASIA): A Review of the Clinical Manifestations and Mechanisms"	B2	Narrative review	The study reports more than 4,400 documented cases of ASIA, with varied clinical manifestations and varying severity. The study suggests that overexposure to adjuvants in genetically predisposed individuals may induce the production of autoantibodies and the development of autoimmune diseases.
Carrera Muñoz et al. (2021)	"Systemic sclerosis and microscopic polyangiitis after systemic exposure to silicone"	B3	Case study	The main result found in the study was the confirmation of systemic exposure to silicone breast implants and the subsequent manifestation of two serious autoimmune diseases. The patient developed systemic sclerosis and vasculitis associated with anti-neutrophil antibodies.
González et al. (2025)	"Silicone Breast Implants and Autoimmunity: A Case Report"	A2	Case study	The study reports a case of a 41-year-old woman who presented autoimmune symptoms after the placement of silicone breast implants, with improvement of symptoms after the removal of the implants. The analysis suggests a correlation between the presence of silicone and autoimmune diseases.

Source: Authors (2025).

The discussion surrounding the relationship between exposure to adjuvants and the induction of autoimmune conditions has intensified in the medical literature. The study by Tervaert et al. (2023), provides substantial evidence of ASIA syndrome, highlighting how exposure to adjuvants, including vaccines and implants, can trigger a variety of autoimmune and

inflammatory symptoms. The investigation by Chen et al. (2022) complements these findings by reporting a significant correlation between adjuvanted vaccines and the development of autoimmune syndromes in genetically predisposed individuals. These results underscore the urgent need for careful monitoring of patients following exposure to such agents, with the aim of preventing and managing conditions that may arise from this complex interaction between the immune system and environmental triggers.

Additionally, the analysis by Woźniak-Roszkowska et al. (2020) on polyacrylamide hydrogel as a filler material in plastic surgeries considers its potential adverse effects, such as the emergence of symptoms associated with ASIA syndrome. The authors point out that, although its use reduces the invasiveness of surgical procedures, the application of polyacrylamide hydrogel (PAAG) may pose serious health risks. The evidence suggesting that hydrogel removal can effectively mitigate symptoms reinforces the need for careful selection of materials used in surgical interventions.

The discussion by Simeonova et al. (2023), offers an interesting perspective by suggesting that, although the relationship between adjuvants and the pathogenesis of Takayasu arteritis is not conclusive, the similarities in immune responses observed in these conditions indicate a possible correlation. In this context, the removal of silicone implants is proposed as a therapeutic strategy, especially considering the timing between implant placement and the onset of symptoms.

Yousfi et al. (2025) emphasize the multifaceted nature of ASIA syndrome, recommending that patients with unexplained systemic symptoms following exposure to adjuvants be considered for diagnosis and treatment. The use of corticosteroids has shown significant symptom relief and although implant removal may be necessary for more effective treatment in persistent cases, pharmacological therapies remain crucial.

The research by Van Assche et al. (2022) introduces the idea that isolated sensory ganglionopathy may be one of the earliest signs of Sjögren's Syndrome in ASIA contexts, with implant removal and immunosuppressive treatment proving effective in stabilizing symptoms. This raises concerns about the safety of silicone implants and their association with autoimmune diseases.

Shoenfeld et al. (2023) stress that silicone breast implant disease should be recognized as a manifestation of autoimmune/inflammatory syndrome induced by adjuvants, caused by the activity of silicone, which can lead to the production of autoantibodies in genetically predisposed individuals. Thus, awareness among the medical community about these manifestations is essential, along with the urgent need to seek alternatives to silicone implants.

Complementing this discussion, Shoenfeld et al. (2020) define ASIA as a syndrome encompassing various autoimmune diseases induced by adjuvants, manifesting in genetically susceptible individuals. The importance of properly recognizing these conditions for accurate diagnosis and understanding the interaction between genetic markers and adverse immune responses is vital to comprehending the phenomenon.

Finally, Carrera Muñoz et al. (2021) highlight the ongoing controversy regarding the relationship between silicone breast implants and the development of autoimmune diseases. Despite case reports and studies suggesting an association, the continued debate over the implications of systemic silicone exposure underscores the urgent need for further investigation.

Overall, the analysis by González et al. (2025) takes a holistic approach to the interaction between genetic and environmental factors, suggesting that silicone breast implants may act as immunological adjuvants. The evidence of symptom improvement following explantation reinforces the idea that implant history should be considered when evaluating patients with autoimmune conditions, underlining the need for a multidisciplinary approach in addressing these complex issues.

4. Conclusion

Autoimmune-inflammatory syndrome induced by adjuvants (ASIA) represents a growing concern in plastic surgery, especially among patients with breast implants. Emphasis is placed on the importance of understanding the relationship between implants and the development of autoimmune diseases, highlighting the relevance of immunological markers as diagnostic and predictive tools. In this context, personalized medicine emerges as a viable strategy for managing these conditions, allowing for more effective interventions and minimizing long-term health risks. Therefore, continued research in this area is essential to improve patients' quality of life and enhance understanding of ASIA pathogenesis. An experimental model for evaluating immunological disorders or the onset of autoimmune diseases could be considered to achieve better outcomes in plastic surgery.

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