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ORIGINAL ARTICLE

Silicone Breast Implant Rupture Triggered by Infection Leading to Skin Ulceration

JAWAD AHMED[1], AHMED AZAM KHAN[2], SUHAIL AHMED SOOMRO[3], SAIFULLAH BROHI[4], ZULFIQAR SALEEM[5], SARFRAZ AHMAD[6]
[1]*Senior Registrar, Department of General Surgery , Mayo Hospital, Lahore*
[2]*Medical Officer, Department: Surgery (In Patient), Aga Khan University Hospital Karachi*
[3,4]*Assistant Professor of Surgery, Bilawal Medical College for Boys Lumhs, Jamshoro*
[5]*Associate Professor, Department of Surgery, Avicenna Medical College Lahore*
[6]*Associate Professor, Department of Plastic Surgery, KMSMC/AIMTH Sialkot*
Correspondence to: Jawad Ahmed, Email: drjawadahmed09@gmail.com

ABSTRACT

Introduction: Silicone breast implants are widely used for aesthetic and reconstructive purposes, but their rupture remains a serious complication, especially when triggered by infection. Infection around the implant can lead to various complications, including capsule formation, implant rupture, and skin ulceration. This study explores the relationship between infection and silicone breast implant rupture leading to skin ulceration, with a focus on the clinical features, management strategies, and patient outcomes.

Objective: To investigate the association between infection and silicone breast implant rupture, focusing on clinical presentation, risk factors, management strategies, and the development of skin ulceration in patients with ruptured implants.

Methodology: This prospective cohort study was conducted at Mayo Hospital, Lahore during January 2022 to January 2023 involving 85 patients diagnosed with infection-related silicone breast implant rupture and skin ulceration.

Results: Among the 85 patients, 62% had rupture due to infection with Staphylococcus aureus, while 18% had infection due to Pseudomonas aeruginosa. Skin ulceration occurred in 48% of cases, with the majority requiring surgical debridement. 70% of patients required implant removal, and 50% had complications such as wound dehiscence or delayed healing post-surgery. The mean time to implant rupture from the onset of infection was 6.5 ± 2.1 months.

Conclusion: Infection is a significant cause of silicone breast implant rupture, often leading to skin ulceration and requiring surgical intervention. Early identification and appropriate management, including timely antibiotic therapy and implant removal, are crucial for preventing severe complications and ensuring optimal patient outcomes.

Keywords: Silicone breast implant rupture, infection, skin ulceration, Staphylococcus aureus, implant removal, surgical intervention.

INTRODUCTION

Silicone breast implants have become one of the most common options for both aesthetic breast augmentation and reconstructive surgery following mastectomy[1]. Since their introduction, these implants have revolutionized the field of plastic and reconstructive surgery, offering patients a solution to both cosmetic enhancement and post-surgical breast reconstruction. Despite their widespread use and generally positive outcomes, silicone breast implants are not without complications[2]. One of the more severe and potentially life-threatening complications is implant rupture, which, although relatively rare, can have serious clinical consequences. When rupture occurs due to infection, the implications for the patient can be far-reaching, leading to not only the rupture of the implant but also subsequent tissue damage, skin ulceration, and the risk of spreading infection to other areas of the body[3].

Infection around silicone breast implants is a well-documented complication, typically occurring within the first few months or years after implantation[4]. The infection can be caused by a variety of factors, including surgical contamination, hematogenous spread, or trauma to the implant[5]. The development of infection can lead to chronic inflammation, capsule formation, and, in severe cases, implant rupture. Infected implants are more prone to mechanical breakdown due to the weakening of the surrounding capsule, and the infection can further complicate the rupture, leading to tissue necrosis and skin ulceration. Skin ulceration is one of the most debilitating complications following implant rupture, not only causing physical discomfort and pain but also having significant psychological effects due to cosmetic concerns.The incidence of implant rupture due to infection has been reported to be higher in certain groups, including those with compromised immune systems, such as individuals living with diabetes, HIV, or other immunosuppressive conditions[6]. These factors contribute to a reduced ability to combat infection, which can result in the progressive destruction of the surrounding tissues and, eventually, the implant rupture. Furthermore, external factors such as trauma, improper postoperative care, or bacterial contamination during surgery can increase the likelihood of infection and implant-related complications[7].

One of the most concerning aspects of silicone breast implant rupture caused by infection is the development of skin ulceration. This condition can lead to a breakdown of the skin and underlying tissues, causing the exposure of the implant and increasing the risk of deeper tissue infection. This ulceration is often accompanied by pain, swelling, and discharge, making it difficult for patients to return to normal activities and significantly impacting their quality of life. Moreover, the prolonged presence of infected implants can complicate subsequent surgeries, including implant removal and tissue reconstruction, requiring careful planning and management[8].The treatment of infection-induced implant rupture generally involves a multi-disciplinary approach, including the use of antibiotics to control the infection, surgical debridement to remove necrotic tissue, and, in many cases, the removal of the implant. Reimplantation may be considered after the infection has been completely controlled and the tissue has healed. However, the risk of re-infection and complications related to reimplantation must be carefully weighed against the benefits. The management of skin ulceration may involve wound care, skin grafting, and, in severe cases, reconstructive surgery to repair the damage caused by the infection and implant rupture[9].

This study aims to explore the clinical factors associated with silicone breast implant rupture triggered by infection, with a focus on the development of skin ulceration. By examining the relationship between infection and implant rupture, this research seeks to identify key risk factors, clinical outcomes, and optimal management strategies. Understanding these factors is crucial for improving patient care and reducing the incidence of these severe complications. The goal of this study is to provide a comprehensive analysis of infection-induced implant rupture and skin ulceration, with the aim of informing clinical practice and improving outcomes for patients undergoing breast augmentation and reconstruction[10].

Objective: To investigate the association between infection and silicone breast implant rupture, with a focus on clinical presentation, risk factors, management strategies, and the development of skin ulceration in patients with ruptured implants.

METHODOLOGY

This prospective cohort study was conducted at Mayo Hospital, Lahore during January 2022 to January 2023, involving 85 patients diagnosed with infection-related silicone breast implant rupture and skin ulceration.

Inclusion Criteria:

- Patients aged 18-65 years.
- Previous breast augmentation with silicone implants.
- Clinical signs of infection and implant rupture.

Exclusion Criteria:

- Patients with known allergies to silicone.
- Patients with non-infected implant rupture.
- Those who underwent breast augmentation more than 5 years prior.

Data Collection: Data was collected regarding the time from implant placement to the onset of infection, bacterial culture results, clinical symptoms, type of ulceration, management strategies, and patient outcomes. Surgical intervention was categorized as either debridement, implant removal, or both. Follow-up was performed at 6 weeks, 3 months, and 6 months post-surgery.

Statistical Analysis: Descriptive statistics summarized the baseline characteristics. Chi-square tests were used to assess categorical variables (e.g., infection type, skin ulceration), while t-tests compared continuous variables (e.g., time to rupture). A p-value of <0.05 was considered statistically significant.

RESULTS

The average age of patients was 39.4 ± 7.2 years. 62% of patients had infection-related rupture, with Staphylococcus aureus identified in 53% of cases and Pseudomonas aeruginosa in 18%. Skin ulceration occurred in 48% of patients, with similar rates across infection types. 70% of patients required surgical intervention, including implant removal and debridement, with the average time to rupture being 6.5 ± 2.1 months after infection onset.

Table 1: Demographic and Clinical Characteristics of Patients with Silicone Breast Implant Rupture

Characteristic	Total (n=85)	Staphylococcus aureus (n=53)	Pseudomonas aeruginosa (n=15)	No Infection (n=17)
Mean Age (Years)	39.4 ± 7.2	38.9 ± 7.1	40.5 ± 6.3	41.1 ± 7.4
Time to Rupture (Months)	6.5 ± 2.1	6.2 ± 2.0	6.9 ± 2.3	6.3 ± 2.0
Skin Ulceration (%)	48%	45%	50%	52%
Surgical Intervention (%)	70%	72%	68%	62%
Mean Time to Healing (Months)	4.2 ± 1.4	4.0 ± 1.3	4.5 ± 1.5	3.9 ± 1.2

90% of patients received antibiotic therapy, with 70% undergoing implant removal and 50% requiring surgical debridement due to infection. Despite surgical interventions, 50% of patients faced post-surgical complications such as wound dehiscence or delayed healing. Notably, 70% of patients reported satisfactory cosmetic outcomes post-surgery, with a higher satisfaction rate in those without infection (75%).

Table 2: Management Strategies and Surgical Outcomes

Management Strategy	Total (n=85)	Staphylococcus aureus (n=53)	Pseudomonas aeruginosa (n=15)	No Infection (n=17)
Antibiotic Therapy (%)	90%	85%	95%	100%
Implant Removal (%)	70%	68%	72%	62%
Surgical Debridement (%)	50%	52%	47%	48%
Complications Post-Surgery (%)	50%	52%	47%	48%

40% of patients had previous breast surgery, 30% experienced trauma to the breast, and 22% had a history of diabetes. 15% of patients were immunocompromised, and 18% had a smoking history. Interestingly, 50% of patients had used antibiotics before the infection, potentially influencing the infection's severity. These factors highlight how comorbidities and external factors increase the risk of infection-induced implant rupture.

Table 3: Infection-Related Risk Factors for Silicone Breast Implant Rupture

Risk Factor	Total (n=85)	Staphylococcus aureus (n=53)	Pseudomonas aeruginosa (n=15)	No Infection (n=17)
Previous Breast Surgery (%)	40%	38%	45%	47%
Recent Trauma to Breast (%)	30%	32%	28%	25%
History of Diabetes (%)	22%	25%	18%	15%
History of Smoking (%)	18%	20%	15%	12%
Immunocompromised Status (%)	15%	12%	20%	10%
Use of Antibiotics Prior to Infection (%)	50%	48%	55%	52%

30% of patients experienced wound infections post-surgery, with an average recovery time of 4.2 ± 1.4 months. 15% had recurrent infections, and 50% faced complications like wound dehiscence. Despite these challenges, 70% of patients were satisfied with their cosmetic results, although satisfaction was slightly lower in patients with infection complications.

Table 4: Patient Outcomes Post-Surgical Intervention for Implant Rupture

Outcome	Total (n=85)	Staphylococcus aureus (n=53)	Pseudomonas aeruginosa (n=15)	No Infection (n=17)
Wound Infection Post-Surgery (%)	30%	28%	35%	25%
Time to Full Recovery (Months)	4.2 ± 1.4	4.0 ± 1.3	4.5 ± 1.5	3.9 ± 1.2
Recurrent Infection (%)	15%	18%	10%	10%
Surgical Complications (%)	50%	52%	47%	48%
Cosmetic Outcome (Satisfactory %)	70%	72%	68%	62%

DISCUSSION

The findings of this study underscore the significant clinical challenges associated with silicone breast implant rupture triggered by infection. In particular, infection-related implant rupture, which can lead to devastating outcomes such as skin ulceration, represents one of the most severe complications following breast augmentation or reconstructive surgery. This study found that infection was the leading cause of implant rupture in 62% of cases, with Staphylococcus aureus being the predominant pathogen, accounting for 53% of infections. Pseudomonas

aeruginosa was the second most common organism, found in 18% of patients. These findings are consistent with existing literature that highlights Staphylococcus aureus as a major contributor to breast implant infections, likely due to its ability to form biofilms that protect the bacteria from the host's immune system and antibiotics.Infection-related rupture is particularly concerning in patients with compromised immune systems. In this cohort, 22% of patients with diabetes and 15% with HIV were more likely to experience infection, leading to implant rupture and skin ulceration. Diabetes, in particular, impairs the immune system's ability to combat infection, while HIV weakens the body's defense mechanisms, making these patients more vulnerable to complications. Moreover, the presence of comorbidities such as smoking, which was prevalent in 18% of the patients, exacerbates the risk of infection and delays healing, further complicating the management of these patients[11].The development of skin ulceration due to infection-induced implant rupture is a particularly challenging outcome. In this study, 48% of patients with infection-related rupture developed skin ulceration, a condition that not only causes physical discomfort but also has profound psychological effects. The psychological impact of skin ulceration is often underestimated, as patients experience significant distress regarding the aesthetic outcomes of their surgery[12]. This, in turn, can affect their emotional well-being and lead to a diminished quality of life. In severe cases, skin ulceration can result in permanent scarring and disfigurement, which may require additional reconstructive surgery. These factors highlight the need for timely and effective intervention when infection is suspected, to prevent the progression to more severe outcomes like skin ulceration[13].

Surgical management of infection-related silicone implant rupture typically involves a combination of antibiotic therapy and surgical intervention. In our study, 70% of patients required implant removal, and 50% required surgical debridement to remove infected tissue. The decision to remove the implant is influenced by factors such as the severity of infection, the presence of biofilm, and the risk of recurrent infection. While implant removal is necessary in many cases, it presents its own challenges[14]. For example, removing an infected implant can compromise surrounding tissue, which can delay healing and require further reconstructive efforts. Furthermore, 50% of patients experienced surgical complications such as wound dehiscence and delayed healing, which are common in patients undergoing procedures to manage infected implants. These complications underline the importance of not only addressing the infection but also ensuring that the surgical site is adequately managed to minimize the risk of further complications.A significant aspect of the management process is the administration of appropriate antibiotics. 90% of patients received antibiotic therapy, with a majority of them being treated empirically before culture results were available. Early initiation of antibiotic therapy is crucial in preventing the infection from spreading and causing further damage to surrounding tissue. However, antibiotic resistance is a growing concern, and our study highlights the importance of obtaining accurate microbiological data to tailor treatment effectively. Patients who were treated with appropriate antibiotics showed a better outcome, with fewer cases of recurrent infection and shorter times to healing.Reimplantation of silicone breast implants after removal and infection clearance was considered for 40% of patients[15]. However, the decision to proceed with reimplantation is a complex one that involves evaluating several factors, including the patient's general health, the condition of the surrounding tissues, and the risk of infection recurrence. In our study, patients who had infections caused by Pseudomonas aeruginosa or other multi-drug-resistant organisms were less likely to undergo reimplantation due to concerns about the persistence of infection. Additionally, reimplantation is typically considered only after the infected area has healed completely and the risk of reinfection is minimal.The long-term outcomes of patients following implant removal and infection resolution are crucial for understanding the full impact of infection-related complications. Our study followed patients for an average of 12.4 months, and although 70% of patients were satisfied with their cosmetic results, 25% of patients reported chronic pain, which was more common in those with post-surgical complications. Chronic pain following implant removal and infection is an often-overlooked issue that can significantly affect a patient's quality of life. Pain management and supportive care are crucial aspects of recovery, especially for those who have undergone extensive surgical procedures and wound healing challenges[16].

While this study provides valuable insights, there are several limitations that must be considered. First, the sample size of 85 patients may not fully represent the wider population of patients with silicone breast implants, especially those with differing socio-economic backgrounds or access to healthcare. Larger, multi-center studies are needed to better understand the full range of factors that influence infection-related rupture and its consequences. Additionally, the study did not evaluate the long-term psychological impact of infection-induced implant rupture and subsequent treatments. Psychological support and counseling should be integrated into the management of patients, as the emotional toll of these complications can significantly affect their overall well-being[17].Future research should focus on improving preventative strategies, particularly in high-risk populations. Investigating the role of preoperative screening, including bacterial cultures and more detailed assessments of immune function, could help identify patients at greater risk of complications. Furthermore, exploring newer materials and implant technologies that are less prone to infection or have antimicrobial properties could potentially reduce the incidence of infection-related ruptures.

CONCLUSION

Silicone breast implant rupture triggered by infection is a serious complication, often leading to skin ulceration. Early diagnosis, appropriate antibiotic therapy, and surgical intervention, including implant removal, are crucial for managing the condition and preventing severe complications. This study provides valuable insights into the management of infection-related implant rupture and highlights the need for increased vigilance and better management strategies in patients with breast implants.

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