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**Original Research Article**

# Histopathological findings in grade IV capsular contracture clinically diagnosed at the Hospital General de México

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## ABSTRACT

**Background:** To describe the histopathological findings in capsular tissue obtained from female patients with grade IV capsular contracture (Baker classification) who underwent explantation with capsulectomy at the Hospital General de México.

**Methods:** An observational, retrospective and descriptive study was conducted at the Plastic and Reconstructive Surgery Service of the Hospital General de México "Dr. Eduardo Liceaga." Female patients with breast implants who were clinically diagnosed with grade IV capsular contracture (Baker) between June 2023 and June 2026 were included. All patients underwent explantation with capsulectomy and capsular specimens were sent for histopathological analysis to the hospital's Pathology Department. Pre-surgical variables (age, implant longevity, number of previous exchanges), intraoperative variables (implant integrity, placement plane, type of capsulectomy) and histopathological findings were analyzed. Descriptive statistics were used, with absolute frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables.

**Results:** A total of 50 female patients were included, with a mean age of 49.1±10.1 years (range: 30–70 years). The mean implant longevity was 12.4 years and 86% had no previous implant exchange. The implant was intact in 92% of cases, the retro glandular plane was identified in 78% and total capsulectomy was performed in 88%. Fibrosis was present in 100% of specimens, predominantly moderate (35, 70%) and extensive/marked (11, 22%). Synovial metaplasia was identified in 33 (66%) of cases. Chronic inflammation was present in 35 (70%) of cases, with nonspecific/mild inflammation being the most prevalent subtype (19, 38%), followed by granulomatous foreign body-type inflammation (10, 20%) and xanthomatous inflammation (6, 12%). Dystrophic calcification was found in 8 (16%), stromal hyalinization in 4 (8%), hemorrhage in 3 (6%), bacterial colonies in 1 (2%) and apocrine metaplasia in 2 (4%). Residual mammary parenchymal findings were identified in 7 (14%) of cases. All 50 (100%) specimens were negative for malignancy.

**Conclusions:** The histopathological analysis of periprosthetic capsules in patients with grade IV capsular contracture demonstrates a consistent pattern dominated by fibrosis, present universally and synovial metaplasia, identified in two-thirds of cases. The presence of chronic inflammation in the majority of patients and dystrophic calcification in a relevant subset reflects a sustained foreign body response. No specimen showed evidence of malignancy. These findings provide a histopathological baseline for grade IV capsular contracture in a Mexican tertiary care center.

**Keywords:** Baker grade IV, Breast implant, Capsulectomy, Capsular contracture, Fibrosis, Histopathology, Synovial metaplasia

## INTRODUCTION

Breast augmentation with implants is one of the most commonly performed aesthetic procedures worldwide. According to data from the international society of aesthetic plastic surgery (ISAPS), it consistently ranks among the top five cosmetic surgical procedures globally.[1] Capsular contracture is the most frequent long-term

complication of breast implant surgery, resulting from an exaggerated fibroproliferative response of the host tissue to the foreign body. It is characterized by the formation of a fibrous capsule around the implant that progressively thickens, hardens and contracts, causing pain, deformity and functional limitation.[2] The Baker classification system, established in 1975, remains the standard clinical tool for grading capsular contracture severity. Grade I corresponds to a normal, soft breast; grade II presents with minor firmness without visible deformity; grade III exhibits visible deformity with moderate firmness; and grade IV is characterized by significant hardness, pain and breast deformity.[3]

Although the clinical and epidemiological aspects of capsular contracture are well documented, its histopathological characterization remains incompletely described, particularly in the Latin American population. The pathogenesis involves multiple mechanisms including the foreign body reaction, biofilm formation, hematoma, subclinical infection and implant surface characteristics.[4,5] From a microscopic standpoint, the periprothesic capsule may present a variety of histological findings.

Fibrosis is the predominant feature, but synovial metaplasia characterized by the transformation of the inner capsular lining into synovial-like tissue has been increasingly recognized as a pathological hallmark.[6] Additional findings include chronic inflammation, dystrophic calcification, hyalinization, hemorrhage and occasionally bacterial colonies suggestive of biofilm activity.[7,8]

The Hospital General de México "Dr. Eduardo Liceaga" is a tertiary-level public hospital in Mexico City with an active plastic and reconstructive surgery service. Given the volume of capsulectomies performed at this institution and the limited local histopathological data on this condition, this study aims to characterize the histopathological findings in periprothesic capsules obtained from female patients with grade IV capsular contracture (Baker), thereby contributing to the understanding of this pathology in our population.

## METHODS

An observational, retrospective and descriptive study was conducted at the Plastic and Reconstructive Surgery Service of the Hospital General de México "Dr. Eduardo Liceaga," Mexico City, Mexico, from June 2023 to June 2026.

### *Inclusion criteria*

Female patients with breast implants who were clinically diagnosed with grade IV capsular contracture according to the Baker classification, who underwent explantation with capsulectomy and whose capsular specimens were sent for histopathological analysis to the hospital's pathology department during the study period.

### *Exclusion criteria*

Patients with incomplete medical records, specimens processed at external laboratories and cases in which the operative report or pathology report was unavailable.

A retrospective review of clinical records and histopathological reports was performed. The following variables were collected:

### *Pre-surgical variables*

Age at surgery (years), implant longevity (years from initial placement to explantation) and number of previous implant exchanges (0, 1 or 2).

### *Intraoperative variables*

Implant integrity (intact or ruptured), implant placement plane (retroglandular or submuscular) and type of capsulectomy performed (total or partial).

Histopathological variables: fibrosis (absent, mild, moderate or extensive/marked), synovial metaplasia (present/absent), type of chronic inflammation (absent, nonspecific/mild, xanthomatous, xanthogranulomatous, granulomatous foreign body-type or lymphoplasmacytic/lymphocytic), dystrophic calcification (present/absent), stromal hyalinization (present/absent), hemorrhage (present/absent), bacterial colonies (present/absent), apocrine metaplasia (present/absent), findings in residual mammary parenchyma (present/absent) and negativity for malignancy (yes/no).

All histopathological analyses were performed by pathologists at the Hospital General de México Pathology Department. Specimens were processed using standard hematoxylin-eosin staining.

### *Statistical analysis*

Statistical analysis was performed using SPSS v26.0/Microsoft Excel. Qualitative variables were described using absolute frequencies and percentages. Quantitative variables were expressed as mean and standard deviation or median and range, according to their distribution.

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Given the retrospective nature of the study and use of de-identified data, individual informed consent was waived.

## RESULTS

A total of 50 female patients were included, with a mean age of 49.1±10.1 years (range: 30–70 years). The mean implant longevity prior to explantation was 12.4 years. Regarding number of previous exchanges, 43 (86%) patients had undergone no prior exchange, 5 (10%) had

one previous exchange and 2 (4%) had two previous exchanges. General characteristics of the study population are presented in Table 1.

In terms of intraoperative findings, 46 (92%) implants were found intact and 4 (8%) were ruptured. The retroglandular plane was identified in 39 (78%) patients and the submuscular plane in 11 (22%). Total capsulectomy was performed in 44 (88%) and partial capsulectomy in 6 (12%) of cases.

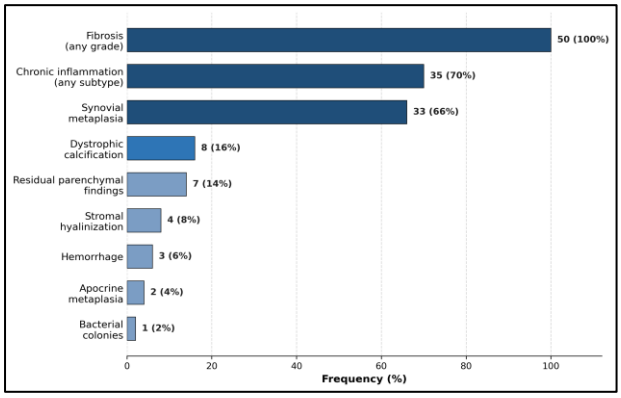


**Figure 1: Frequency of histopathological findings in periprothesic capsules.**

Histopathological analysis of the periprothesic capsules revealed a consistent pattern across the study population. The most prevalent finding was fibrosis, present in all 50 (100%) specimens, with moderate fibrosis being the most frequent grade (35, 70%), followed by extensive/marked (11, 22%) and mild (4, 8%); no specimen showed an absence of fibrosis. Synovial metaplasia was identified in 33 (66%) of cases.

Chronic inflammation was present in 35 (70%), with nonspecific/mild inflammation as the most frequent subtype (19, 38%), followed by granulomatous foreign body-type (10, 20%), xanthomatous (6, 12%) and an absence of chronic inflammation in 15 (30%) of cases. Neither xanthogranulomatous nor lymphoplasmacytic/lymphocytic inflammation was identified in this series. Complete histopathological findings are detailed in Table 2.

Additional findings included dystrophic calcification in 8 (16%) patients, stromal hyalinization in 4 (8%), hemorrhage in 3 (6%), bacterial colonies (consistent with biofilm) in 1 (2%) and apocrine metaplasia in 2 (4%). Residual mammary parenchymal findings were identified in 7 (14%) cases, predominantly consisting of usual ductal hyperplasia and ductal ectasia. All 50 (100%) specimens were negative for malignancy.

**Table 1: General and perioperative characteristics of the study population (n=50).**

| Variable | N (%) | mean±SD |
|---|---|---|
| **Age (in years)** | — | 49.1±10.1 |
| **Implant longevity (years)** | — | 12.4 |
| **Previous exchanges: 0** | 43 (86) | — |
| **Previous exchanges: 1** | 5 (10) | — |
| **Previous exchanges: 2** | 2 (4) | — |
| **Implant integrity: Intact** | 46 (92) | — |
| **Implant integrity: Ruptured** | 4 (8) | — |
| **Placement plane: Retroglandular** | 39 (78) | — |
| **Placement plane: Submuscular** | 11 (22) | — |
| **Capsulectomy: Total** | 44 (88) | — |
| **Capsulectomy: Partial** | 6 (12) | — |

**Table 2: Histopathological findings in periprothesic capsules (N=50).**

| Histopathological finding | N | % |
|---|---|---|
| **Fibrosis** | | |
| **Absent** | 0 | 0 |
| **Mild** | 4 | 8 |
| **Moderate** | 35 | 70 |
| **Extensive/marked** | 11 | 22 |
| **Synovial metaplasia–present** | 33 | 66 |
| **Chronic inflammation** | | |
| **Absent** | 15 | 30 |
| **Nonspecific/mild** | 19 | 38 |
| **Xanthomatous** | 6 | 12 |
| **Xanthogranulomatous** | 0 | 0 |
| **Granulomatous (foreign body-type)** | 10 | 20 |

Continued.

| Histopathological finding | N | % |
|---|---|---|
| **Lymphoplasmacytic/lymphocytic** | 0 | 0 |
| **Dystrophic calcification–present** | 8 | 16 |
| **Stromal hyalinization–present** | 4 | 8 |
| **Hemorrhage–present** | 3 | 6 |
| **Bacterial colonies–present** | 1 | 2 |
| **Apocrine metaplasia–present** | 2 | 4 |
| **Residual parenchymal findings–present** | 7 | 14 |
| **Negative for malignancy** | 50 | 100 |

## DISCUSSION

In this observational, retrospective and descriptive study, 50 female patients with grade IV capsular contracture (Baker) who underwent explantation with capsulectomy at a tertiary-level public hospital in Mexico were analyzed. The histopathological characterization of their periprothesic capsules revealed a consistent pattern in which fibrosis and synovial metaplasia were the predominant findings. Fibrosis was the most universal finding in our series, present in 100% of specimens. This is consistent with the pathophysiological understanding of capsular contracture as a fibroproliferative disorder driven by myofibroblast activation and collagen overproduction.

Several authors have described the progressive increase in capsule thickness and collagen density as the contracture grade worsens, reaching its most pronounced expression at grade IV.[9,10] In our cohort, moderate fibrosis predominated (70%), followed by extensive/marked fibrosis (22%), reflecting the advanced stage of contracture at the time of surgical intervention, as expected in a grade IV population.

Synovial metaplasia was found in 66% of cases, representing the second most frequent histopathological finding. This phenomenon, characterized by the transformation of the inner capsular surface into synovial-like tissue, has been previously described as a distinct adaptive response of the peri implant tissue and may be related to the mechanical forces exerted by the contracting capsule.[6,11] Its high prevalence in two-thirds of our cohort supports the concept that this is not an incidental finding but rather an integral histological feature of advanced capsular contracture.

Chronic inflammation was identified in 70% of cases. Unlike what is frequently emphasized in the literature, the most prevalent subtype in our cohort was nonspecific/mild inflammation (38%), followed by the granulomatous foreign body-type (20%) and xanthomatous (12%) subtypes. The presence of a foreign body-type granulomatous response in one-fifth of cases reflects a persistent macrophage-mediated reaction to implant material and possibly to silicone extravasation, particularly relevant in the 8% of cases with ruptured implants identified intraoperatively. These findings are broadly consistent with reports in the international literature describing the foreign body granulomatous reaction as a core component of capsular pathology, although the predominance of milder, nonspecific inflammatory patterns in our series may reflect differences in implant exposure duration and tissue sampling.[7,12] Dystrophic calcification was observed in 16% of patients. This finding has been associated with long-standing capsular contracture and prolonged implant exposure, consistent with the mean implant longevity of 12.4 years observed in our cohort.[13] Stromal hyalinization, present in 8%, likely represents an advanced stage of fibrous tissue remodelling and has been previously described in association with chronic fibrosis.[8]

Of particular relevance is the identification of bacterial colonies in 2% (1 patient). Although our specimens were not subjected to culture or specific biofilm staining, the presence of coccoid bacterial colonies on histopathological analysis is consistent with subclinical biofilm activity, which has been proposed as a contributing etiological factor in capsular contracture through sustained low-grade inflammation.[14,15] The low frequency of this finding in our series may reflect the limited sensitivity of routine hematoxylin-eosin staining for biofilm detection rather than its true prevalence.

Residual mammary parenchymal findings were present in 14% of cases, reflecting the incidental inclusion of adjacent breast tissue during capsulectomy. These findings predominantly usual ductal hyperplasia and ductal ectasia were benign in all cases and no malignancy was identified in any of the 50 specimens in our study. This 100% negative rate for malignancy is reassuring and consistent with the reported literature.[16]

The study is limited by its retrospective and descriptive nature and the sample size of 50 patients, characteristic of a single-center series for a relatively infrequent surgical complication. The absence of standardized grading of histopathological findings across all specimens given that they were reported by different pathologists over the three-year study period may introduce some degree of inconsistency. Additionally, the lack of implant surface type (smooth vs. textured) and fill material (saline vs. silicone gel) data limits subgroup analysis. Future prospective studies with standardized histopathological protocols and multivariate analysis would be valuable to establish correlations between specific findings and clinical or implant-related variables.

## CONCLUSION

The histopathological analysis of periprothesic capsules in 50 female patients with grade IV capsular contracture (Baker) at the Hospital General de México demonstrates a consistent pattern dominated by fibrosis, present universally and synovial metaplasia, identified in two-thirds of cases. Chronic inflammation, predominantly of the nonspecific/mild and foreign body granulomatous subtypes, was present in 70% of patients. Dystrophic calcification and stromal hyalinization were frequent additional findings reflecting a sustained host response to the implant. The identification of bacterial colonies in a subset of patients suggests a potential role of subclinical biofilm. All specimens were negative for malignancy.

These results provide a histopathological baseline for grade IV capsular contracture in a Mexican tertiary care center, contribute to the characterization of this complication in the Latin American population and support the continued routine submission of capsular specimens for histopathological analysis following explantation.

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