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ORIGINAL ARTICLE

Breast-implant texturing associated with delamination of capsular layers: A histological analysis of the double capsule phenomenon[☆]

Délamination capsulaire associée avec la texturation des implants mammaires : une analyse histologique du phénomène des capsules doubles

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KEYWORDS

Double capsule;
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Implant texturing;
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Silicone breast implant;
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Summary

Background. – Macro-texturing of breast implants was developed with the double goal of improving implant stabilization within the breast cavity and decreasing the rate of capsular contractures. However, recent evidence suggests that double capsular formation, a potentially worrisome phenomenon associated with late seromas and biofilms, occurs with preponderance in macro-textured implants. Our objective was to analyze histologically different regions of double capsules to determine if they are more prone to mechanical movements.

Methods. – A prospective analysis including patients undergoing second-stage expander to definitive breast-implant reconstruction post-mastectomy was conducted after intraoperative identification of the double capsule phenomenon. Two samples were collected from each

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MOTS CLÉS

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silicone ;
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silicone

capsules around the implant, located centrally and laterally. The specimens were sent for histological analysis by the institution's pathologist.

Results. — In total, 10 patients were identified intraoperatively with partial double capsule phenomenon. Among samples retrieved from the lateral aspect of the breast implant, all were associated with delamination and fractures in the collagen matrix of the double capsules. This phenomenon was not observed in any sample from the dome of the breast.

Conclusions. — Breast-implant macro-texturing plays an important role on delamination of capsules on lateral portions of the breast, which may have an etiologic role in double capsule formation. Manufacturing implants with macro-texturing on one side and smooth surface on the other could diminish mechanical shear forces responsible for these findings.

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Résumé

Introduction. — La macro-texturation des implants mammaires a été développée avec l'objectif d'améliorer la stabilité de l'implant au sein de la cavité mammaire et de diminuer le taux de contracture capsulaire. Toutefois, des données récentes suggèrent que la formation de capsules doubles, qui est un phénomène potentiellement inquiétant associé avec les sérums tardifs et les biofilms, se produit avec prépondérance dans les implants macro-texturés. Notre objectif était d'analyser les différentes régions des capsules doubles sur des lames histologiques afin de déterminer si elles sont plus susceptibles aux mouvements mécaniques.

Méthodes. — Une analyse prospective, incluant des patients opérés en deux temps par exandeur puis pour une reconstruction mammaire définitive par implant, a été effectuée après une identification peropératoire du phénomène de la capsule double. Deux échantillons ont été prélevés pour chaque capsule entourant l'implant, situés centralement et latéralement. Les spécimens ont été envoyés au département de pathologie de l'institution pour une analyse histologique.

Résultats. — Au total, 10 patients ont été identifiés en peropératoire avec le phénomène de la capsule double. Parmi les échantillons prélevés sur l'aspect latéral de l'implant mammaire, tous étaient associés avec une délamination et des fractures dans la matrice de collagène des capsules doubles. Ce phénomène n'a pas été observé dans les autres échantillons prélevés dans la partie centrale du sein.

Conclusions. — La macro-texturation des implants mammaires joue un rôle important dans la délamination des capsules sur l'aspect latéral du sein, ce qui peut avoir un rôle étiologique dans la formation des capsules doubles. La fabrication d'implants avec une macro-texture sur un côté et une surface lisse de l'autre pourrait diminuer les forces de cisaillement mécaniques responsables pour ces trouvailles.

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Introduction

Interest in surface macro-texturing of silicone implants originated with the intent to decrease breast capsular contractures and to improve stabilization of implants within the breast pocket [1–4]. However, parallel to an improvement with this particular complication, occurrence of a greater number of double capsules and other complications has occurred in recent years [5].

By definition, a double capsule occurs when two distinct layers form around the breast implant, with the inner layer firmly attached to the interface of the implant device and the outer layer separated from the former by the intercapsular space. The smooth surfaces of both layers which are in contact with the intercapsular space are responsible for micro-movements within the double capsules. The clinical relevance of this dynamic relationship resides in the increased risk of synovial metaplasia, chronic infection, late seroma, and possibly breast-implant associated anaplastic large cell lymphoma (BIA-ALCL) [6].

Several hypotheses have been generated to explain the pathophysiology of double capsule formation. One potential avenue of causality relates to the macro-texturing of implants such as Biocell[®] macro-textured prosthetic devices (Allergan, Irvine, California), which have been associated with an abnormally higher rate of double capsule formation compared with smooth-surfaced implants. The mechanism by which macro-textures lead to this phenomenon has yet to be elucidated, yet recent literature suggests that either mechanical dynamics, bacterial/biofilm development or periprosthetic fluid accumulation may contribute as etiologic factors.

Based on our previous research where we investigated the pathogenesis of double capsule formation by means of electron microscopy [4], we set out to determine if particular regions of the macro-textured implant, on a larger scale, are more prone to the development of double capsules. The findings could provide more knowledge about implant physiology, which is critical at a time where major concerns about the extremely rare risk of carcinogenic transformation

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