International Journal of Surgery Open 3 (2016) 1–7

Contents lists available at ScienceDirect

International Journal of Surgery Open

journal homepage: www.elsevier.com/locate/ijso

Review Article

A literature review and summary of capsular contracture: An ongoing challenge to breast surgeons and their patients

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ARTICLE INFO

Article history:
Received 12 July 2015
Received in revised form 24 March 2016
Accepted 1 April 2016
Available online 6 April 2016

Keywords:
Breast augmentation
Implant
Reconstructive surgery
Capsular contracture
Baker classification

ABSTRACT

Capsular contracture is a significant difficulty where implants are used in both breast augmentation and breast reconstruction surgery. This report reviews the published literature focusing on factors and techniques that reduce the incidence of this complication, as well as evaluating the available treatment options for patients who have developed a contracture.

A search of the MEDLINE database for clinical studies involving the understanding, diagnosis and management of capsular contracture was performed, with 106 articles deemed relevant for this review. Our search criteria included observational studies as we wish to discuss and highlight the areas of this condition that have been investigated, and unfortunately there is limited clinical evidence in regard to high quality trials in this field.

Risk factors for capsular contracture are multi-factorial, and all surgeons should aim to minimise these as much as possible both intra- and peri-operatively. However, in high risk patients it is not achievable to completely remove these elements. When capsular contracture does develop, there are currently only a limited number of surgical options including capsulotomy, capsulectomy with or without re-implantation, or reconstruction with autologous tissue. These procedures, as well as the original implant surgery, ought to be discussed with patients on an individual basis, taking into account their personal needs and expectations.

The future of this complication may lie in the development of pharmaceutical interventions, and recent studies have shown promising results. Although this field requires more research, the effectiveness of some new pharmaceutical approaches, to provide alternative non-surgical options for patients with capsular contracture, can only aid both patients and the breast surgeon.

1. Introduction

Capsular contracture is a complication of breast augmentation which continues to reduce both surgeon and patient satisfaction with the end appearance of the breast. It has been well documented across the literature although still remains an enigma in both its formation as well as in regard to reducing its presentation.

There are numerous available systematic reviews and hundreds of studies on various topics within capsular contracture. Our objective for this paper is to review and present the current understanding of capsular contracture in breast augmentation that is available in the literature. We can find no single paper which summarises its aetiology, initial interventions to reduce its occurrence and later management.

2. Methodology

We reviewed the literature, searching the EMBASE and MEDLINE databases from inception to January 2014 with the following search term used:

capsular[All Fields] AND ("contracture"[MeSH Terms] OR "contracture"[All Fields]) AND ("breast"[MeSH Terms] OR "breast"[All Fields])

This as well as pertinent linked 'related citations' were reviewed.

We decided to include all studies, including observational reports so as to provide an understanding of current methodology and areas of interest in this condition. There is a recent systematic review by Araco et al [1] which showed little high quality studies, and we did not wish to repeat this study.

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http://dx.doi.org/10.1016/j.ijso.2016.04.001

Exclusion criteria included those with abstracts not written in English and communication letters.

Using the search terms above, 803 articles were found. These were reviewed in regard to title and abstract using a priori criteria resulting in 150 articles being reviewed in more detail. Of these, 106 were found to be relevant and are referenced below. The following aim to summarise the findings in the papers reviewed.

3. Capsular contracture – A review of the literature

3.1. Introduction

Patients who undergo breast augmentation or reconstruction with implants are largely satisfied with the resulting breast appearance [2,3].

Despite this, it is still the surgeon's duty to accurately council and educate the patient about the potential complications (both those that can occur, and those that are believed by the patient to be possible, from the surgery) [3–23] and how these may lead to an undesirable result. These complications include haematoma, scarring (both hypertrophic and keloid), infection, seroma, necrosis, breast asymmetry and most importantly, the commonest complication seen, capsular contracture [24–28].

Capsular contracture develops due to the fact that the implant is too large to be successfully phagocytised by the body, as would happen with a much smaller imbedded foreign body. Likewise, silicone is too inert to cause a toxic reaction, as it has no active bindings sites [29]. Instead, a fibrous capsule, made of myofibrils and collagen, surrounds the foreign implant. Normally it does not exceed the 1 mm [30] – 1.5 mm [31] thickness. This capsule formation is described as a part of the normal healing process, and some studies suggested it might even help to keep the implant in situ [16,32].

However, when this capsule thickens and the implants dimensions are altered, then the condition is described as capsular contracture.

At best the capsule compromises the aesthetic appearance of the breast; at worst it causes the breast to feel firm, even hard and painful [16,29].

As the capsule contracts around the implant it does so with a centripetal force, changing the natural implant shape to a sphere, a shape which has the smallest surface area to volume ratio [20]. This leads to the appearance of spherical breasts, defining capsular contracture, a finding similar to the unnatural effects of the push-up bra [20]. Likewise, the pressure on the walled-off implant causes it to feel harder to touch then when no capsule is present.

The incidence of capsular contracture is difficult to pinpoint. The use of new techniques has meant that some surgeons achieve consistently low contracture rates [20].

Certain factors such as the indication for surgery will increase one's risk, and the incidence in these patient groups will naturally be higher [27].

Capsular contracture is commonly graded using the Baker Classification [6,33]. This has been revised to take into account those patients who have had prosthetic breast reconstruction, rather than solely patients with firm breasts after augmentation mammaplasty, as the original classification described. Typically patients graded Class III or IV will require intervention.

Although a range from zero to 50% has been noted [34], a more realistic incidence for capsular contracture, would be between 8% and 15% [35].

There is some discrepancy as to agreement over when capsular contracture is likely to develop and present. Some studies have noted its appearance as early as two years after surgery [3], while others have documented development at five years [34]. Studies suggesting presentation within a year support the subclinical infection pathway described below, as well as the relationship to surgical technique, drain placement and other short-term complications [3].

Presentations later than this are possibly caused by a secondary infection from systemic bacteraemia, elastomer degradation or filler bleeds [27], or the chronic effect of the implant on surrounding tissues [3].

4. Capsular contracture: Diagnosis and classification

4.1. Diagnosis

4.1.1. Clinical

Capsular contracture may initially present with mild breast induration. With progressive increase of capsule thickness, the breast becomes firmer. It may progress and eventually shrink the breast in such a way that it totally distorts the breast shape. It may result in a range of symptoms, varying from local tenderness to severe pain [1].

4.1.2. Radiological

Mammography. Mammography is ideal for breast parenchymal evaluation and obvious extracapsular silicone implant rupture. It fails, however, to consistently detect intracapsular implant rupture [36,37].

Mammography can be useful in evaluating the breast with minimal to moderate capsular contracture. With severe capsular contracture, mammography has a very limited use in assessing the breast [38].

Ultrasound scan [39–45]. The diagnostic accuracy of ultrasound in the hands of a skilled radiologist has a very high sensitivity [39–42]. However, due to the steep learning curve, the absence of a panoramic view and the high operator dependence, there is much debate about the usefulness of this investigative tool.

Magnetic Resonance Imaging. Numerous studies have shown that MRI is the most reliable test [37,46–48], and it has been proven to also be the most accurate, as well as being non-operator dependant [49–51].

MRI has therefore been crowned the 'gold standard' [52] for imaging implants. In the USA, the Food and Drug Administration guidelines recommend MRI-implant evaluation at 3 years after breast augmentation and every 2 years thereafter [53].

4.2. Classification of capsular contracture

As above, Bakers classification is commonly used as the standard for commenting on the amount of breast contracture evident. The basis of this classification is around patient perceived firmness or pain in the breast, the clinically palpable implant and the implants visibility. Grade IV is universally deemed an indication for removal of the implant, although earlier classes should be reviewed on a patient by patient basis. The original classification described by Baker in 1978 [33], aimed at the augmented breast, was expanded to include reconstructed breasts in 1995 by Spear, with the division of I into IA and IB [6]. IA still described an augmented or reconstructed breast which appeared absolutely natural, but IB described a palpable implant on examination. These descriptions are summarized in Table 1. Gylbert made further comments on the palpable deformity in 1989 [54], and multiple other descriptions have been attempted over the years [55], although the Baker classification remains to both be popular and the most practical method of assessing breast firmness [6].