Pocket work for optimising outcomes in prosthetic breast reconstruction

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Summary

Implant breast reconstruction is a recommendable alternative for women who have undergone mastectomy and lack the necessary subcutaneous fat tissue for an autologous reconstruction. On the other hand, many women reject the morbidity of the donor site, prolonged recovery periods and muscular weakness associated with autologous reconstruction. Therefore, muscle and skin expansion has become one of the most popular approaches used in breast reconstruction. Nevertheless, the expansion process may be hindered by events like seroma formation, implant rotation, moving upward or downward altering the location or shape of the submammary crease, capsule contracture or extrusion. Since the advent of the anatomical expander, two-stage reconstruction with the expander/implant sequence has become the most popular choice in prosthetic breast reconstruction (PBR). The second surgical stage, in which the tissue expander is exchanged for the permanent implant, offers a unique opportunity for pocket work. Pocket work strategies and their indications should be known and applied by the surgeon who aims at optimising PBR aesthetic results.

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immediate (IPBR), delayed (DPBR) and at the same time in
either one or two stages (Table 1). Even though patients
may prefer reconstruction with permanent expanders such
as the Becker type, or the most modern ones such as the
McGhan Style 150, to avoid a second surgery, the authors
disourage this practice because it does not allow adequate
symmetrisation if a displacement occurs. Since the advent
of the anatomical expander, two-stage reconstruction with
the expander/implant sequence has become the most pop-
ular choice in PBR. During the second stage, expander re-
moval and final implant placement provide an excellent
opportunity to perform pocket work. Pocket work (PW) en-
ances implant location and allows for strategic alterations
of soft tissue, if they are necessary. The authors aim at
showing the resources they currently use to optimise PBR
symmetry, similitude and natural look.

Materials and methods

Between January 1992 and January 2005, 310 patients
whose ages ranged from 27 to 72 years (average 46 years),
underwent PBR (Table 1). All procedures were carried out
under general anaesthesia. The authors reviewed all those
cases in which PW was necessary during the replacement of
the expander by the final implant in a two-stage recon-
struction, or after the final implant placement in either
a second stage or a primary reconstruction (immediate or
delayed). Several causes for PW were analysed: inade-
quately positioned implants, capsular or muscular restric-
tions and capsular laxity that required surgery to correct
the disharmony. These situations were reviewed in patients
with either the expander or the final implant.

As previously defined by the authors, the reconstructed
breast shows some anatomical features determined not
only by the implant shape but also by the soft tissue includ-
ing the capsule. Three distinctive features can be high-
lighted in a reconstructed breast:

(a) The submammary crease (SMC) is the feature that upon
evaluation ensures the best aesthetic impact. From an
aesthetic point of view, SMC is enhanced by three fea-
tures: height, shape and definition.

(b) The reconstructed breast projection is influenced by
the success of the expansion process and the implant’s
features.

(c) The upper mammary margin (UMM) defined as the tran-
sition between chest and the implant’s cephalic boundary.

These factors determining the final outcome in breast
reconstruction are always conditioned by the thickness and
malleability of the soft tissues covering the implant, in-
cluding the capsule, and by the position of the implant on the
chest. When the expander or final implant is not located at
the right position to achieve symmetry or is having sectorial
restrictions, it will require pocket work. These cases can be
organised into eight categories and are listed in Table 2.
There a number of solutions which can be applied either in
combination or in isolation depending on the deformity:

(a) Capsulorraphies: the capsulorraphy is a resource aiming to
reduce the pocket size at any margin. Most of the
time, it is executed at the level of the SMC and, less
frequently, at the level of the anterior axillary line
when the implant is lateralised. The technique pro-
duces a re-definition of the SMC or the anterior axillary
line with a running suture preserving capsule integrity.
Additionally, the creation of raw areas by electrocau-
terty promotes a better adherence. This can be carried
out very superficially, creating just a shallow scoring, or
deeper, sectioning the fascia superficialis, fat and cellular
subcutaneous tissue (CST). Then, the hypodermis is
fixed to the thoracic wall with a permanent running
suture, in order to achieve a better defined SMC. When
an expander or implant is removed, the lower
boundary of the pocket folds itself, thus points of refer-
ences are lost. Therefore, it is necessary to recreate
the real position of the SMC as if the expander were po-
ositioned. Before deciding where to reposition the SMC,
it is necessary to know what the original position was.
This position is mimicked exerting traction and counter-
traction manoeuvres. The surgeon retracts and raises the
flap by means of a retractor, while the assistant pulls the skin
downwards. This way, the gravitational effect and the presence of the implant inside
the pocket is simulated, which is very helpful for the
surgeon. Capsulorraphies almost always involve the lift-
ing point A, where a curve named C starts as the main point
of reference, is named point A (Fig. 1). This point
does not necessarily correspond with the SMC drawn
on the skin with the patient in standing position. The
difference in height between the SMC of both breasts,
in centimetres, is transferred above point A, determin-
ing point A’. Point A” results from transferring the same
distance on the curve C, below point A. This way, the
degree of ascent results from transporting point A” to
the back wall of the capsule, coinciding with point A’,
and with point A being the turning point. When the
implant is lateralised, capsulorraphy of the anterior
axillary line should be complemented with the

<table>
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<tr>
<th>Table 1</th>
<th>Patients and modalities of PBR employed</th>
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<tr>
<td>One stage immediate reconstruction (primary)</td>
<td>17 patients (11 bilateral)</td>
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<tr>
<td>Immediate expander — implant sequence</td>
<td>198 patients (48 bilateral)</td>
</tr>
<tr>
<td>Permanent expander — implant immediate reconstruction (220 patients — 282 IPBR)</td>
<td>5 patients (3 bilateral)</td>
</tr>
<tr>
<td>One stage delayed reconstruction (primary)</td>
<td>9 patients (1 bilateral)</td>
</tr>
<tr>
<td>Delayed expander — implant sequence</td>
<td>74 patients (3 bilateral)</td>
</tr>
<tr>
<td>Permanent expander — implant delayed reconstruction (90 patients — 94 DPBR)</td>
<td>7 patients</td>
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Total: 310 patients — 376 PBR
enlargement of the pocket towards the midline in order to avoid recurrence.

(b) Capsulotomies: the capsule is severed in order to release adhesions developed during the expansion process.

(c) Capsulotomies/myotomies for plane exchange: are intended to expand the pocket capacity, usually downward. This always implies the change of anatomical plane towards a thinner plane lacking capsule and muscle (Fig. 2). This plane provides the required malleability to achieve an adequate projection of the implant’s lower pole. The change of plane is executed at least 2 cm above the SMC, incising capsule and muscle and then undermining proceeds above the fascial layer. This way, the lower pole of the implant is just covered by the SCT and skin, achieving enough enlargement and distensibility without previous expansion. Nevertheless, if this manoeuvre was performed in isolation, two different tensions would be created and as a consequence a double bubble deformity would result.10 As a result, capsulotomies/myotomies for plane change are always associated with capsulotomies/myotomies for progressive relaxation.

(d) Capsulotomies/myotomies for progressive relaxation: previous to switching the anatomical plane, the enlargement of the pocket always involves performing capsulotomies and radial myotomies in inverted fan shape, extending 2.5 to 3 cm above and finishing at the level of the change of plane (Fig. 3).

(e) Capsulectomies/myectomies: involve the resection of an important portion of the capsule or capsule and muscle. They usually start as capsulotomies/myotomies for plane change and, once the inferior boundary is reached, a resection of a crescent-shaped portion of capsule and muscle (patch myectomy) is carried out (Fig. 4). Capsulotomies/myotomies for progressive relaxation are always associated with this resource.

(f) Liposuction at the level of the SMC: although it cannot be strictly considered pocket work, liposuction can really improve SMC definition, therefore it has been included in this classification. In most of the cases it is associated with capsulorraphy in order to provide better SMC definition.

Results

During the 13-year study period, 105 of the total of 376 PBR cases (27.9%) required PW. Of the 282 IPBR, 81 cases (28.7%) needed PW. Of the 94 cases reconstructed through DPBR (25.5%), 24 required PW. The most frequent procedures employed in this series for PW are listed in Table 3 and its complications in Table 4. Results were very good in terms of mammary symmetry and patient satisfaction (Figs. 5–9).

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Ten cases also required capsulorraphy of anterior axillary sulcus and muscle. Associated with defatting of the SMC in five cases. One case was associated with a previous fluid collection. They required a new capsulorraphy, three of them executed by the Nava’s technique.

Discussion

The possibility of offering a relatively immediate solution to mastectomised patients, a reduction in surgical steps and practice, has made PBR a very popular technique. However, its success will always depend on the immobility of the implant and the absence of capsular contracture. The position of the implant, where its backside contacts the chest wall, is the most prominent factor in determining symmetry in PBR. The permanence and evolution of the implant is conditioned by the interaction between human tissues and implant. After implant placement, there is always a foreign body response to the capsule. Thus, the capsule is the second most important factor determining symmetry in PBR. Capsular consistency ranges from total softness to severe restriction (capsular contracture) and has been matter of study since the introduction of silicone gel implants by Cronin and Gerow. Capsular contracture is a common problem, which produces implant distortion, disrupting PBR symmetry. On the other hand, total softness or laxity can also be problematic. In cases of a strong pectoralis major muscle, its repetitive contraction can progressively promote downward displacement of the implant. This is the description of a scenario where the only distorting factors are random. Whereas, in some cases, the deformity may result from tactical or surgical errors when planning or executing surgery, in others postoperative complications such as fluid collection produce implant dystopia. All these situations require PW. Sometimes, in cases of bilateral reconstruction, it is hard to account for the fact that a meticulously planned reconstruction, after an expansion process, does not reach adequate symmetry. Hypothetically, if pockets and implant positions were strictly identical, the unfolding of the expander as the expansion process progresses would be responsible for more evident asymmetries. An extremely soft unilateral capsule would work in the same way. Sectorial capsular contractures do not usually modify implant position; perimetral shape and tridimensional results are altered though. In patients undergoing two-stage PBR, there is a second surgical stage which allows the surgeon to revise any problem in symmetry, thus preserving the patient-physician relationship.

PW aims at providing the reconstructed breast with an anatomical shape, which does not exclusively depend on the implant. When considering PW, the problem should be

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<th>Table 3</th>
<th>Most frequent procedures in pocket work</th>
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<tr>
<td>Capsulotomies/myotomies for plane change</td>
<td>67 cases 63.8%</td>
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<tr>
<td>Capsulorraphies by lower SMC</td>
<td>30 cases 28.5%</td>
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<tr>
<td>Capsulectomies/myectomies</td>
<td>6 cases 5.7%</td>
</tr>
<tr>
<td>Capsulotomies</td>
<td>2 cases 1.9%</td>
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<tr>
<td>Total</td>
<td>105 cases 100%</td>
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a Ten cases also required capsulorraphy of anterior axillary line.
b Associated with defatting of the SMC in five cases.

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<th>Table 4</th>
<th>Complications</th>
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<td>Seroma</td>
<td>11 cases</td>
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<tr>
<td>Haematoma</td>
<td>1 case</td>
</tr>
<tr>
<td>Rotational dystopia</td>
<td>2 cases</td>
</tr>
<tr>
<td>Recurrence of SMC lowering</td>
<td>5 cases</td>
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a One case was associated with a previous fluid collection.
b They required a new capsulorraphy, three of them executed by the Nava’s technique.
approached focusing on the five layers of tissue covering the implant: skin, SCT, plane of fibrosis (which replaces breast tissue), muscle and capsule. In cases of seroma, the immediate adherence between SCT and muscle is impaired. Due to halstedian principles, the communication between axilla and the surgical lodge makes self-limited fluid collections more frequent. Furthermore, in these cases there is a higher deposit of collagen fibres producing a thicker and more rigid layer of fibrosis. As a consequence, capsulotomies/myotomies for plane change are not enough to improve lower pole definition. The removal of a patch of capsule, muscle and fibrosis through the procedure named capsulectomy/miomectomy solves the problem.

Capsulotomies are needed when adherences between the anterior and posterior walls of the pocket are created. These adherences are frequently founded at the level of the pocket covered by the serratus anterior muscle. After releasing such adherences, a capsulorrhaphy to regularise the perimeter is usually required.

The main indications for capsulorraphies are the descent or the lateralisation of the expander. It can also be necessary to improve SMC definition, without displacing the implant. In 1979, Lewis reported the use of an abdominal sliding flap to provide coverage in breast reconstructions and its fixation as in internal capsulorrhaphies. Later, Ryan described a similar resource although approaching through the crease itself. In 2001 Massiha published a SMC reconstruction technique through an internal approach, which is similar to the method employed by the authors. In this work, the authors present a novel method for the exact determination of the necessary SMC lifting. According to this method, transferring the distance between two horizontal tangents to the creases of both breasts (difference in heights), above and below the point of reference A, allows crease symmetry to be achieved. Point A, which has been defined as the lowest point of the posterior wall of the capsule, must be exactly located by means of traction and counter-traction manoeuvres. In 1998 Nava proposed an approach for SMC definition through an incision of fascia and TCS and suture of the posterior wall of the pocket to the dermis. This approach was applied in only three patients of this series, being indicated for recurrence of SMC lowering. In the remaining cases, the liposuction of the SMC achieved an adequate definition.

Figure 5  (a) A case of high restrictive pocket and insufficient lower pole expansion. (b) After capsulotomy/myotomy for plane change associated to radial myotomies in an inverted fan shape.

Figure 6  (a) A case of restrictive pocket and sectorial contracture at lower and upper pole. (b) After capsulotomy/myotomy for plane change.
This is usually complemented by wearing a brassiere, which exerts pressure on the SMC and 1.5 cm below.

The surgeon always works with delayed flaps at the moment of PW. These flaps provide safety in procedures such as capsulotomies/myotomies for plane change, capsulectomies and myectomies. The execution of these manoeuvres, involving dermal or dermofatty pedicles with low risk of cutaneous necrosis, is evidence of that. Ryan’s technique of thoracic advancement flap in bucket handle can be cited as another example.15

In terms of postoperative seromas, they can be prevented by keeping drains in place until output is less than 30 cc per day17 and providing immobilisation through the wearing of tailor-made brassieres with medial, lateral and inferior reinforcements for 1 month. If fluid collection is detected, it should be treated with corticosteroids, prophylactic antibiotics and arm immobilisation. Surgical drainage is seldom necessary. In the sentinel node era these seromas will probably diminish. The most feared effect of fluid collection is implant malposition. The authors have recently described the application of polyglycolic mesh as a supplement to the pectoralis major in cases of IPBR in order to allow the settings of bigger implants without previous expansion, while preventing implant displacements.18

Not only does radiotherapy affect the capsule consistency but it also affects the plane of fibrosis of the surgical lodge and reinforces the collagen matrix of the SCT. Therefore, all tissue layers are affected. On the other hand, flaps raised from radiated areas are not reliable enough. The most commonly accepted theory explaining the effects of radiation has focused on decreased vascularity and hypoxia in affected tissues. More recently, impaired leukocyte function has been considered as an additional factor in the pathophysiology of radiation injury.19 Patient’s clinical records should always be carefully analysed, focusing on radiotherapeutic events. Some of the patients who have been radiated after conservative surgery under mastectomy after cancer recurrence. Nowadays, radiated patients are seldom regarded as candidates for PBR. On the other hand, the current trend of radiating patients with less involved axillary lymph nodes will eventually increase radiotherapy indications.20 There is not a consensus about radiating mastectomised patients with a permanent breast implant21 or with a tissue expander in place before their permanent implant exchange.22

Figure 7 (a) Lateralised expander and restriction at internal lower quadrant. (b) After capsulotomy/myotomy for plane change associated with lateral capsulorraphy.

Figure 8 (a) A case of descent of the SMC. (b) After capsulorraphy to mimic contralateral mammary ptosis.
Prosthetic breast reconstruction

In conclusion, after analysing results obtained with this group of patients, it is evident that two-stage PBR with the sequence expander/implant has been, in the authors’ hands, the best surgical option in order to optimise results in terms of symmetry and natural look.

The second surgical stage, in which the tissue expander is exchanged for the permanent implant, offers a unique opportunity for PW. Pocket work strategies and their indications should be known and applied by the surgeon who aims at optimising PBR aesthetic results.

References


Figure 9 (a) Patient with extracapsular contracture due to pre-muscular fluid collection and subsequent fibrosis. (b) After capsulectomy/myectomy.


