

ПРИМЕНЕНИЕ СИЛИКОНОВЫХ ИМПЛАНТАТОВ В ПЛАСТИЧЕСКОЙ ХИРУРГИИ МОЛОЧНЫХ ЖЕЛЁЗ (обзор литературы)

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В статье представлены данные литературы относительно показаний к установке силиконовых грудных имплантатов в пластической хирургии. Рассмотрены особенности предоперационной подготовки пациенток, направленные на предотвращение развития послеоперационных осложнений. Описана техника проведения хирургического вмешательства, преимущества и недостатки разных методов. Рассмотрены различия при выборе оперативного доступа и расположение имплантата по отношению к молочной железе. Указаны рекомендации по выбору вида имплантатов, определению объёма предполагаемых силиконовых протезов, а также по использованию оптимального доступа для их внедрения. Изучены ближайшие и отдалённые осложнения и предлагаемые авторами мероприятия для их профилактики. Контрактура фиброзной капсулы, окружающей имплантат, по данным различных исследований, является наиболее частым осложнением увеличивающей пластики молочной железы, требующим хирургической коррекции. Одним из основных осложнений всех видов аугментационной маммопластики является вторичный птоз молочной железы. Распространённым осложнением увеличивающей маммопластики служит неправильное положение имплантатов, к которому относится их несимметричность и расположение на разной высоте. При тубулярной груди возможна двойная субмаммарная складка, если не исправить тубулярность ареолы. Авторы считают, что целый ряд нерешённых вопросов, касающихся аугментационной маммопластики, оптимальной хирургической тактики при её проведении, наличие ближайших и отдалённых осложнений является причиной проведения дальнейших исследований, связанных с увеличивающей маммопластикой. Повышенная частота неудовлетворённости пациенток отдалёнными результатами аугментационной маммопластики, необходимость профилактики развития такого осложнения как фиброзная контрактура, вынуждают к поиску новых методик. Таким образом, применение силиконовых имплантатов при аугментационной маммопластике нуждается в дальнейшем исследовании с целью оптимизации конечного эстетического и клинического результата.

Ключевые слова: аугментационная маммопластика, силиконовые имплантаты, контрактура молочных желёз, гипотрофия молочных желёз.



APPLICATION OF SILICONE IMPLANTS IN MAMMOPLASTY (Literature Survey)

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In the article literature data concerning indications to placement of silicone breast implants in plastic surgery are presented. Peculiarities of preoperative preparation of patients aimed at prevention of postoperative complications are considered. The technique of surgical intervention, advantages and disadvantages of different methods are described. Difference in choice of surgical approach and positioning of implant relative to mammary gland are considered. Recommendations are given on selection of the type of implant, on determination of the volume of supposed silicone breast-implant prostheses, and also on the choice of optimal access for their insertion. The early and long-term complications and measures proposed by the authors for their elimination are studied. According to different studies, the commonest complication of the augmentation mammoplasty is contracture of the fibrous capsule surrounding the implant that requires surgical correction. One of main complications of all kinds of augmentation mammoplasty is secondary ptosis of mammary gland. A common complication of the augmentation mammoplasty is incorrect position of implants such as their asymmetry and location on different levels. In case of tubular breast a double inframammary fold may result unless tubularity of areola is corrected. Authors think that a significant number of unsolved problems concerning augmentation mammoplasty, optimal surgical approach, existence of the immediate and long-term complications are reasons for further study of augmentation mammoplasty. Increased dissatisfaction of patients with long-term results of augmentation mammoplasty, necessity to prevent such complication as fibrous contracture, create an urgent need for search of new methods. Thus, application of silicone implants in augmentation mammoplasty requires further study with the aim of optimization of the final aesthetic and clinical result.

Keywords: *augmentation mammoplasty, silicone implants, contracture of mammary glands, mammary hypotrophy.*

Augmentation mammoplasty is one of the commonest surgical operations in plastic surgery. According to the existing data [1,2], in 2001 it was the third most popular opera-

tion in plastic surgery after rhinoplasty and liposuction, and in recent years it has been gaining leading positions. Among surgical interventions on the mammary gland (MG),

39% of operations on the given anatomical segment are reduction mammoplasty, 44% are augmentation mammoplasty, and 17% were correction of the form of nipples or of areola [3,4].

About 1% of American women wear silicone implants. More than 40% of women are not satisfied with the volume and shape of their breast. Development of modern implants made of silicone, as well as numerous research works and recent achievements in this field considerably increased safety of the augmentation mammoplasty with use of silicone implants in comparison with the previous years, however, some problems still remain unsolved [5,6]. Data of questionnaires show that more than 30% of women are not happy with the shape or volume of their breast in the long-term period after operation and apply for a repeated operation [7,8]. Complications after mammoplasty reach 6% to 30% depending on the kind of surgical intervention [9]. One of the main problems of use of silicone implants is development of capsular contracture with the incidence of 1-2 %, according to different authors [2,10].

Formation of a connective-tissue capsule around any foreign object that gets into an organism is a biologically determined process, and the so called capsular fibrosis is a normal and predictable result that accompanies placement of silicone implants in a female organism. In case of development of capsular contracture of mammary glands a connective-tissue capsule that surrounds the implant, shrinks, compresses the implant, changes its shape, in result the mammary

gland becomes hard, deformed, painful and cold to touch. A cosmetic defect disappears, and the disease starts [11].

Capsular contracture is one of the main causes of pain syndrome and a reason for a repeated operation in this group of patients. Besides, in modern literature little attention is given to the problems of dishormonal diseases of mammary glands before and after placement of implant [12]. Despite the fact that the majority of authors share the opinion that modern implants do not produce any influence on development of an oncological process in mammary glands, some authors consider this question to be not completely studied [13]. There are continuous attempts to improve long-term results of the operation through development of new implants with the improved shape and rough coating, and to study the influence of the form and coating of the implant on its acceptability in an organism and reaction of the surrounding tissues [14]. Thus, application of silicone implants in augmentation mammoplasty requires further study of some problems to optimize the final aesthetic and clinical result.

Preoperative preparation of patients.

To achieve the optimal aesthetic result in the postoperative period it is important that some measures should be observed before the operation to prevent development of postoperative complications. The most favorable period is the first half of the menstrual cycle, since coincidence of the operation with menstruation may induce premenstrual edema of the mammary glands and enhanced bleeding [15]. On the other hand, some surgeons suggest

that the menstrual cycle should not be taken into account altogether, and they believe that the time of the operation does not play any significant role in the postoperative result if it plays any role at all [7].

Of importance is a correct preoperative examination with the aim to identify unfavorable factors and to determine the optimal shape of the future mammary glands. Despite the fact that it is practically impossible to completely predict the future shape of the mammary gland, a disregard of numerous factors that could influence it both in pre- and postoperative period, leads to irreparable consequences. It is absolutely wrong to rely only on the reliability of the implant shape or on the element of luck in this complicated procedure.

All factors that influence the final result may be divided to anthropometric, or associated with the constitutional peculiarities of the patient, and other factors, non-dependent of the patient's body [16]. An important, if not the main, role in determination of the shape and volume of the implant, and of the surgical approach in general, is played by the shape of chest. An important step in preoperative planning is evaluation of the condition of the bone-muscle skeleton. A problem of the preoperative preparation is evaluation of deformation of the chest which often comes to light during the operation [8]. Deformations of the chest wall may be the cause for development of asymmetry of the mammary glands and make a negative contribution to the outcome of the operation.

Of paramount importance for achievement of the predictable aesthetic result is

evaluation of the contour of the anterior chest wall at the stage of planning of the augmentation of the mammary gland. A barrel-shaped chest may provoke divergence of the mammary glands in the postoperative period. At the same time such shape of the chest creates a visual impression of a large breast even with its insignificant enlargement for which reason one should be attentive while choosing the volume of the future implant [17]. An impression of significant augmentation of the MG is also achieved with a wide flat anterior chest wall. Here the major part of the implant lies in front of the chest wall in the frontal plane and is totally used for enlargement of projection of the MG. Conversely, with a narrow round chest the major mass of the implant is positioned laterally, that is, it does not participate in augmentation of the anteroposterior projection of the MG. This causes a paradoxical phenomenon when the same implants give an impression of a significant augmentation in an athletic woman and a moderate augmentation in an asthenic woman.

Indications to use of certain kinds of implant are determined by the structure of the chest wall. In planning the augmentation of the anteroposterior projection in a patient with a hollow chest and a stoop back it should be borne in mind that a significant part of the implant filler will be used for compensation of the retraction of the rib cage, and augmentation of the projection will be less than expected. It is undesirable to use implants with the concave posterior surface with a hollow chest. Besides, there may also be asymmetry

of the anterior surface of ribs. That is why planimetric measurements of distances on the anterior chest wall are of little use for prediction of the projection. Intraoperative use of sizers permits to visualize the result and to timely correct the choice of the implant [18,19].

Such common pathology of spine as scoliosis may also significantly influence the postoperative result of augmentation operations on breast. Asymmetry of the chest associated with scoliosis of the spine can lead to different asymmetries of the mammary glands. The main reference points for determination of asymmetries of the mammary glands are nipple-areolar complex and infra-mammary fold.

Evident asymmetry of the mammary glands although rather rare in general population of women, may produce a negative influence both on sexual life of a female patient and on her psychological condition.

Techniques of surgical procedure. There exist different techniques of the surgical operation for emplacement of a silicone implant in the region of the mammary gland. All these surgical procedures are similar, but, nevertheless, some differences exist:

1) different choice of surgical approach:

a) infra-mammary approach is the most popular method of emplacement of an implant. Its advantages are technical simplicity, good visualization of the wound, possibility to provide aseptical condition, preservation of sensitivity of the nipple-areolar complex; drawbacks are a visible scar and difficult marking since the scar should be at the level

of a new infra-mammary fold. Indications to operation with this approach in our clinics are a good infra-mammary fold (which conceals a scar), presence of a previous scar in this zone and reoperation;

b) periareolar approach implies insertion of the implant through an incision on the pigmented region of the areola; its advantage is a less visible scar. However, the size of areola does not always permit to insert the implant though it; it is inevitably associated with damage to the mammary gland tissue, in result the access is less aseptical. Besides, periareolar implantation may probably lead to the emergence of microcirculation in milk ducts and to formation of cysts. The access to the lower edge of the gland may be gained through formation of a subcutaneous tunnel which may finally result in non-uniform surface of the gland, in seroma and inflammation in this zone. This incision may be recommended to patients with the diameter of areola at least 5 cm, with inclination to formation of keloid scars, since the probability for formation of keloid or hypertrophic scars on the pigmented area of areola is minimal, and also when there exists a necessity to reduce the periareolar excess of skin. This access may be used to eliminate the anomaly of the gland base (tubular breast), which requires dissection of the constriction zone and uniform distribution of the mammary gland. We also use the periareolar approach for emplacement of anatomical implants, while transaxillary approach is used only for emplacement of round implants because of impossibility of their correct orientation.

c) periumbilical approach suggests insertion of the implant through the umbilicus. Positioning of the implant is limited by prepectoral space. With this access the visual control of dissection in formation of the implant pocket is difficult, and in result it is difficult to achieve symmetry in emplacement of the implants. Besides, this access can be used only for saline-filled implants;

d) transaxillary approach is performed through an incision in the armpit [7,20]. Recently the transaxillary access is becoming increasingly popular. The method showed an evident advantage of a concealed incision; besides this approach provides easy access to the retropectoral space. The disadvantage is impossibility of visual control of formation of the pocket for implant. The limitation of this access does not permit formation of the retropectoral cavity in sufficient volume, in result the implant was displaced upward or a double vesicle was formed in the region of infra-mammary fold. A negative aspect of transcapillary approach is a probability for development of complications in the form of bleeding, capsular contracture, in which cases access through other routes is suggested.

Recently many recommendations based on extensive research appeared concerning application of minimally invasive methods of insertion of silicone implants. The most preferable is transaxillary bilateral augmentation endoscopic mammoplasty using implant prostheses [21,22]. The authors indicate the following advantages of this method:

- minimal surgical injury, edema, inflammatory process;

- short after-care period;
- preservation of sensory innervation of tissues due to detailed visualization of nerve-vascular structures through a laparoscope;
- formation of aesthetically acceptable scars in the axillary region.

But, nevertheless, with all this the authors do not deny the following significant disadvantages of the method:

- technical complexity;
- need in expensive equipment;
- limitation of the method to application of gel implants of small and medium size (up to 350 ml);
- difficulties in keeping symmetry of the level of the infra-mammary fold;
- impossibility to carry out subsequent revisions including those with capsulotomy through axillary access. Thorough weighing up of advantages and disadvantages of the endoscopic method leads to the conclusion that application of the method is reasonable only if there exists a specialist having a vast experience in endoscopic techniques, which significantly narrows indications to use of this method.

2) position of the implant relative to the mammary gland. The surgeon may choose to position the implant in three variants:

- directly behind the mammary gland;
- in space behind the major pectoral muscle;
- dual plane pocket – installation of the implant partly behind the muscle and partly behind the gland.

Advantages of positioning of the implant behind the gland are simplicity of

dissection, milder painfulness in postoperative period and possibility to use large-sized implants. However, this method possesses a number of drawbacks: high incidence of capsular contracture, visibility of the edges and of thickness of covering tissues and a high rate of hematoma development since the mammary gland is rich in vessels with a very high probability for their damage during mobilization of the gland.

A method of emplacement of the silicone implant behind the major pectoral muscle was developed as an alternative to subglandular emplacement and was meant to eliminate the drawbacks of the latter. The advantages of positioning of the implant behind the major pectoral muscle are reduced incidence of capsular contracture, lower visibility of the implant edges under skin, and minimal probability for development of hematomas, since subpectoral zone is non-vascularized. The drawbacks of this method include a probable limitation of the choice of implant size, evident pain syndrome, probability for displacement of the implant in the postoperative period due to contraction of muscle.

Early and long-term complications. Nowadays, if the operation is conducted by an experienced plastic surgeon in a specialized hospital, the risk of development of complications after augmentation mammoplasty is sufficiently reduced [23]. However, according to the data of Allergan corporation, one of the leading world manufacturers of mammary implants, the amount of repeated interventions after augmentation mammoplasty makes 23% within the first five years after

the operation [24]. But the data are approximate and vary depending on the geographical location of the country and on other factors.

All complications may be classified to early and late.

Early complications include:

1) accumulation of fluid in the cavity of implant emplacement. This may be either serous fluid, or a small amount of blood – in most cases the situation can be easily managed by aspiration of the fluid with a syringe through a small puncture. If not, this complication can be easily eliminated by a repeated immediate operation;

2) inflammatory process at the site of operation is rather rare, but to prevent this, antibiotics are always administered in the postoperative period;

3) problems with wound healing associated with a risk of spontaneous appearance of the implant. In case the wound breaks down and the implant appears, it is required to let the skin heal and after that repeat the operation of breast augmentation with placement of new or the previously used sterilized implants;

4) reduction in sensitivity of breast in the area of nipples or in larger area – the cause of this phenomenon is distension of small branches of tactile nerves supplying skin that is unavoidable in preparing the pocket for implant. Sensitivity usually returns in a month or two and in most patients completely recovers within half a year. In some patients the patches of reduced sensitivity remain in different parts of the breast, but this rarely disturbs them [23].

The most common complication of the augmentation mammoplasty requiring surgical correction is contracture of the fibrous capsule with the incidence of 1-2% of cases [23,25,26]. Here, the mammary gland becomes harder than usual. According to O.B. Dobryakova, a typical sign of capsular contracture in US, CT and MRI-mammography is thickening of periprosthetic fibrous capsule. The author established a direct dependence between the parameters of thickness of periprosthetic fibrous capsule and the extent of evidence of fibrous capsular contracture [27].

The overwhelming majority of plastic surgeons believe that capsular contracture of the mammary glands develops within the first year after implantation and becomes increasingly evident with "ageing" of silicone implants [11,28]. According to some authors, one of the main causes of development of fibrous capsular contracture is infection in the early postoperative period. In view of this, prophylaxis of fibrous capsular contracture is one of the main tasks of a plastic surgeon [25]. Some authors believe that use of laser radiation for prophylaxis of fibrous capsular contracture reduces inflammatory reaction at the early stage of formation of a connective-tissue capsule, declines sclerotic changes around the implant and also suppresses functions of fibroblasts with all this resulting in development of a tender thin connective-tissue capsule [29]. Botulotoxin introduced intramuscularly (or even subcutaneously with the subsequent diffusion into muscles) produces a prolonged myorelaxation effect [20] which facilitates a prolonged repose and

creates more favorable conditions for formation of elastic and more physiological capsule around the implant. O.B. Dobryakova and N.V. Kuznetsova conducted research on 532 patients with the past operation of augmentation mammoplasty who agreed to pass a repeated examination, and fibrous contracture was found in 52 (9.77%) patients. In 64 patients who were operated on in other clinics and developed fibrous contracture, prophylaxis of fibrous capsular contracture was conducted using laser radiation. The authors found out that after prophylaxis of the contracture by laser radiation its development was delayed up to 12 months which reliably differs from the period of development of fibrous capsular contracture in patients without prophylaxis. With prophylaxis of the fibrous capsular contracture by introduction of botulotoxin the first symptoms appeared twice later as compared to the group where the prophylaxis was not conducted [18].

At present there is no universally accepted opinion as to the optimal method of elimination of fibrous contracture of the mammary gland [30]. O.B. Dobryakova who has been long time engaged in problems of prophylaxis and treatment of this complication of augmentation mammoplasty, states that conservative therapy of patients with II degree fibrous capsular contracture results in reduction of the average thickness of fibrous capsule with long persistence of the obtained effect [27]. However, the majority of authors believe that the only way to eliminate the contracture is a surgery with opening of the capsule through incision in the region of the

scar remained after the first operation, with partial removal and emplacement of the implant into the pocket formed in a new plane [10]. But, nevertheless, some authors think that capsulotomy is ineffective and explain it by the fact that this surgical intervention does not change conditions that have led to constrictive fibrosis of the capsule. Alteration of all components – a surgical pocket, an implant filler, type of its shell extend the scope of subsequent interventions, prolong postoperative care period and increase financial expenditures [11].

Another main complication of all kinds of augmentation mammoplasty is a secondary ptosis of the mammary gland [31]. Recurrence of ptosis after use of the most common methods of mastopexy and augmentation mammoplasty both separately and in combination ranges from 9.5 to 36.3% [32,33]. V.G. Meshalov et al. propose use of mesh implants to prevent secondary ptosis in the long-term postoperative period. A clinical investigation was conducted with participation of 116 patients operated on ptosis of MG that developed after different kinds of mammoplasty; the patients were divided into two groups: the main group and comparison group. The comparison group included females who were made standard operations for correction of postoperative ptosis (52 patients including 29 patients after operations made in our clinic). The main group consisted of females that were made operations developed in our clinic with use of mesh allotransplants (64 patients with 36 of them after operations made in our clinic). It was found that use of a

mesh allotransplant (polypropylene mesh) as an addition to operations on surgical correction of postoperative ptosis of the mammary gland does not induce any clinically significant local and systemic reactions and creates a more stable supporting structure that provides a reliable reduction of three-year incidence of ptosis recurrence (10.9%) and of its extent as compared to use of standard methods of mammoplasty (30.8%) [31].

One more complication of augmentation mammoplasty is incorrect position of implants including their asymmetry and location at different height. This complication mostly develops after application of transaxillary approach, because in some cases of using this method the implant tends to move upward toward the armpit under the influence of muscle effort [10]. This may result in the appearance of unnatural bulging in front of the armpit. This complication is eliminated by suturing the upper edge of the implant pocket and its deeper continuation.

In tubular chest a double inframammary fold is probable if the tubularity of the areola is not corrected. This complication requires the second operation. Nowadays we have done away with it through a more thorough preoperative examination.

Thus, a number of unsolved questions concerning augmentation mammoplasty, optimal surgical approach in this operation, existence of the early and long-term complications are the reasons for further investigations associated with augmentation mammoplasty. High frequency of dissatisfaction of patients with the long-term results of the augmenta-

tion mammoplasty, necessity for prevention of such a complication as fibrous contracture

urge searching for new methods.

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