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Nursing Care and Causative Analysis of Grade IV Capsular Contracture Following Breast Cancer Expander Implantation

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Abstract

Objective: By observing the treatment and nursing care of a patient with Grade IV capsular contracture following breast cancer expander implantation and subsequent Stage II reconstruction, we aim to analyze the reasons for the formation of capsular contracture after Stage I expander implantation and prevent its recurrence following Stage II reconstruction. **Methods:** In May 2020, the patient noticed an increase in the size of a breast mass. In August, she underwent AC-THP neoadjuvant chemotherapy, followed by a "right breast-conserving nipple-areolar subglandular excision + right axillary lymph node dissection + expander implantation" surgery in November 2020. Radiation therapy began in January 2021. During radiation therapy, the patient experienced severe breast hardening, distortion, tenderness, and was diagnosed with Grade IV capsular contracture. To relieve the capsular contracture, the patient underwent a "contracted capsule incision and release procedure + removal of the right breast expander + right breast implantation" surgery in July 2021. Postoperatively, measures were taken to prevent incision infection, emphasizing aseptic techniques, ensuring smooth negative pressure drainage, reducing skin flap tension, monitoring skin flap blood supply, actively preventing subcutaneous effusion and hematoma, and applying appropriate compression dressings. **Results:** The patient was discharged after the removal of the drainage tube. During the postoperative follow-up at 3 and 6 months, there was no recurrence of capsular contracture, and the breast appeared full, upright, and relatively soft. There were no complications such as hematoma, infection, breast implant rupture, breast sagging, or displacement. The patient had a good outcome without additional financial or surgical burdens. **Conclusion:** The occurrence of Grade IV capsular contracture in the patient is generally related to infection after Stage I expander implantation, improper

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compression dressing, excessive saline injection causing content infiltration, and radiation therapy. Therefore, it is recommended to enhance the intraoperative and postoperative prophylactic use of antibiotics after Stage I expander implantation. Intermittent saline injection after surgery, with the amount of saline gradually increasing rather than filling all at once, is advisable. This helps the breast tissue gradually adapt to expansion, reducing the risk of capsular contracture. Postoperatively, patients should be instructed to wear pressure garments and breast elastic bandages while intensifying breast monitoring during radiation therapy and increasing postoperative follow-up.

Keywords

Breast Cancer, Capsular Contracture, Expander Implantation

1. Introduction

Capsular Contracture is a common complication of breast augmentation with implants. The incidence of pericardial contracture has been reported in the literature to range from 1.3% to 30.0%. [1] The causes of Capsular Contracture are still not well understood, and there are no predictive, preventive, or effective treatments available. Membrane contracture can cause breast implants to become hard and rigid, this can affect the natural feel and elasticity of the breasts. Patients may experience pain, tightness or discomfort in the breast area. Contracture of the envelope can cause adverse effects on the breast skin, such as wrinkles, orange peel-like texture or skin tension. Severe cases may affect the natural movement and flexibility of the breasts, thereby affecting function, and impacting daily activities, a case of grade IV Capsular Contracture complicating the implantation of a breast cancer expander in our department, to address the causes of its Capsular Contracture, analysis of problems and improvement measures in the handling process, a reference for clinical caregivers.

2. Case Presentation

2.1. Details of the Case

Miss Zeng, women, 37 years old, was diagnosed with right breast cancer after surgery. Its discovery of the swelling in 2018, the enlargement of the swelling in May 2020, 4 courses of chemotherapy with "doxorubicin + cyclophosphamide" regimen, 4 courses of chemotherapy with the "THP" regimen in August 2020, work out. On 13.11.2020, under general anaesthesia, "subcutaneous adenomectomy of the right breast with preservation of the nipple and areola + lymph node dissection of the right axilla + implantation in the expansion phase" was performed, 2021.01 Start of radiotherapy. Period of radiotherapy, the patient's breasts appear hardened, distorted and distorted in appearance, and painful to the touch. According to the Baker classification of Capsular Contracture, this patient belongs to Baker class IV (see **Figure 1**), highly sclerotic breasts, significantly abnormal breast shape, the symptoms include pain and discomfort from pressure. Surgery required

Figure 1. Patient developed grade IV Capsular Contracture.

according to guidelines grade III-IV, on 2021.07.23, under general anaesthesia, the patient underwent "contracture peritonectomy and release + right breast expander removal + right breast implantation".

2.2. Surgical Management and Approach

In this patient, stage I expander breast reconstruction was used, during dilator retention, the patient underwent radiotherapy, peritoneal contracture of the expander found during radiotherapy, hardening of the patient's breasts, Twisted and distorted appearance, Tenderness, etc. Capsular Contracture usually occurs, conservative non-surgical treatments are ineffective, and most require surgical treatment, surgical treatment includes contracture peritonectomy and contracture peritonectomy. The study suggests that removing the entire capsule results in a larger incision, postoperatively, it is possible for the capsule to reform, therefore, the removal of the entire envelope is not advocated, only an incision and release procedure is performed to enlarge the cavity. In this case, the skin color and elasticity gradually recovered 6 months after the end of radiotherapy, when the damage to the soft tissues of the skin caused by radiotherapy was repaired and softened, which was conducive to the healing of the secondary surgical incision, at this time, stage II prosthetic reconstruction was used to release the pericardial contracture, and the dilator was replaced with a prosthesis. Through careful nursing care, the patient did not experience a recurrence of pericardial contracture, and the patient's outcome was good, with no additional increase in the patient's economic and surgical burden.

2.3. Post-Operative Care of Prosthetic Implants

2.3.1. Keep Negative Pressure Drainage Open

To prevent pooling of blood or secretions, observe the amount and nature of drainage fluid and change it in time, registering for traffic diversion, if the drainage fluid is bright red blood and is large in volume, report to the doctor and treat it promptly. The drain can be removed if the color of the drainage turns yellowish and is less than 10 ml in 2 - 3 days.

2.3.2. Observation of Flap Haemodynamics

Skin haematology should be closely monitored postoperatively, this includes skin temperature, color, tone, swelling and capillary filling response. If the skin is pale it suggests arterial ischaemia and should be reported to a doctor for immediate management, if the skin is bruised it suggests impaired venous return.

2.3.3. Postoperative Antibiotics Were Applied to Prevent Infection

It is used in the hour before surgery and antibiotics are applied intravenously for a week after surgery.

2.3.4. Breast Massage Starting 2 Weeks after Surgery

2 times a day, each time 15 - 20 minutes, the right hand from the outside of the lower side, the outside of the upper side, the inside of the upper side, the inside of the lower side of the order of counterclockwise direction of the left breast; the left hand from the outside of the lower side, the outside of the upper side, the inside of the upper side, the inside of the lower side of the clockwise direction of the right breast, adhere to the massage for 6 - 12 months.

2.3.5. Compression Corset and Compression Bandage Can be Worn Immediately after Surgery

Compression corsets and compression bandages are recommended 24 hours a day for 1 month. May be worn intermittently for 1 - 3 months, and may be replaced with a properly sized, non-ringed underwire bra after 3 months. Preservation of the nipple-areola or areola incision requires an open window to observe nipple blood flow and color and to avoid pressure to avoid nipple ischemic necrosis. Wear a professional compression corset for about a week of observation, continuing for 6 months.

2.4. Results

The patient was discharged with the drain removed. Follow-up after 3 and 6 months after surgery, there was no recurrence of postoperative Capsular Contracture, and the appearance of breasts was full, firm, and better soft. No complications such as haematoma, infection, rupture of breast implant, sagging and upward movement of breasts. Although grade IV periosteo constriction occurred in this patient after surgery, the implant was a dilator, which itself required a second surgery to replace it with a prosthesis, and complications such as infection and periosteo constriction did not occur after the second surgery, which did not increase the burden of multiple surgeries on the patient.

3. Discussion

3.1. Definition and Grading of Capsular Contracture

Capsular Contracture is a common complication after prosthetic implantation and can occur at any time postoperatively. The general term refers to the formation of an envelope around the prosthesis after implantation of a prosthesis. The incidence fluctuates between 1.3% and 30.0% [1], Envelope contracture is gener-

ally classified into four grades: Grade I breast tenderness. Grade II is mildly hardened and the breast implant or expander can be touched but not visible from the outside. Grade III moderate hardening, breast implant or expander can be easily touched and can be seen from the outside. Grade IV severe hardening, pain sensitivity, and distortion of the implant or expander [2] [3] [4] [5]. In this case, the patient was painfully sensitive to touch, the dilator was severely distorted, and the grading was classified as Grade IV. Grading and assessment of Capsular Contracture can affect patient outcomes after breast reconstruction.

3.2. Causes of Capsular Contracture

The cause of Capsular Contracture is not well understood and may be related to the following factors [6]. 1) Location and size of expander implantation: Dilators implanted under the pectoralis major muscle greatly reduce the incidence of pericardial contracture due to the abundant blood flow around them and the constant squeezing and rubbing of the chest muscles against the dilator. Excessive water injection can increase the tension around the peritoneum and put excessive pressure on the peritoneum, which may increase the risk of peritoneal contracture. 2) Postoperative haematoma: The haematoma not only increases the chances of Capsular Contracture occurring but also advances the time of its occurrence considerably. 3) Radiotherapy: It has been shown that there is a close relationship between the development of Capsular Contracture and radiotherapy after implantation of chest wall prostheses or expanders. Radiotherapy increases the incidence of complications in implant breast reconstruction, radiotherapy can also increase the incidence of prosthetic projection [7], thereby decreasing implant longevity. 4) Infections: Infection may lead to inflammation and fibrous tissue proliferation around the peritoneum, causing the peritoneum to become tense and thus preventing normal expansion of the breast expander. Infection triggers an immune system response that causes immune cells to gather at the site of infection. This may increase the risk of Capsular Contracture, as immune cells may release chemicals that cause fibrosis and contracture. In our patient, WBC 6.58*109 and NE% 70.1% were normal values after dilator implantation, and there was no indicator of infection. The first water injection was started on day 15 after expander implantation in this patient, with 70 ml of water injected each time for a total of 10 injections, as too much water injected into the breast implant expander may increase the risk of Capsular Contracture. The development of Capsular Contracture in this patient may have been related to excessive postoperative water injection.

3.3. Prevention of Capsular Contracture

It is important to thoroughly clean and sterilise the prosthesis before breast reconstruction surgery to reduce the risk of infection. This involves a double wash using water and neutral soapy water, followed by a saline rinse to remove surface impurities. Subsequently, the cleaned prosthesis is placed in a clean metal box and sterilized by autoclaving (at 121˚C for 15 - 20 minutes) [3]. Because silicone

rubber carries static electricity, the cleaned prosthesis should avoid contact with substances such as cotton gauze, synthetic fabrics or talcum powder to prevent the formation of foreign bodies on its surface, which can cause unwanted rejection reactions. These steps are very important to ensure that the surgical materials are hygienic and safe.

3.3.1. Surgical Procedures Should be Meticulous

The operation should be gentle and meticulous to minimize tissue damage, the deep interspace of the pectoralis major muscle should be peeled off thoroughly, and the cavity should be wide enough (with a diameter greater than the diameter of the breast implant by 1 cm or a little more) to avoid leaving a cord-like hold. After the placement procedure is finished, gently tap or massage the breast with your hand to ensure that the implant is fully extended within the cavity without any lumps or folds.

3.3.2. Postoperative Prevention of Haematoma and Infection

1) The haemostasis during breast implantation should be thorough, and 2 drainage tubes should be placed in the wound, and the amount and nature of drainage should be closely observed in 24-48 h. 2) Intraoperative use of local antimicrobials plus hormones in the breasts. 3) Placement of inflatable breast implants inject saline (according to the size of the implant) plus dexamethasone 10 mg, gentamicin 80,000 μ and flush the implant placement cavity with antibiotics, routinely applying antibiotics for 1 week after breast augmentation to keep the breasts clean in order to reduce haematoma and infection. [8] 4) Postoperative massage generally starts from 3-5 days, the strength is as good as the breast prosthesis can move, twice a day, 20 min each time, and the strength can be gradually increased after removing the stitches.

3.3.3. Postoperative Water Injection Care for Dilator Implantation

Expander implantation is watered down and then replaced with a permanent prosthesis after adequate skin volume or radiotherapy. Duration of water injection: dilatation usually starts 2 weeks after surgery, and thereafter once a week or every fortnight; the amount of water injected each time is 5% - 10% of the volume of the dilator; the dilatation time takes 1-3 months. Note on water injection: After the skin of the reconstructed breast is expanded, there may be congestion, which is normal; Pain usually disappears 20-30 min after injection; Observe 10-15 min after each water injection, care during indwelling dilators: Keep local skin clean; do not wear small, tight clothing; Strenuous exercise is not advisable; prevent mosquito bites; avoid sunburn and scalding to rebuild the skin on the surface of the breast; avoid excessive weight gain. Timing of implant replacement: sufficient skin laxity in the breast area; if the patient receives adjuvant chemotherapy or radiotherapy, replacement should be postponed until the end of treatment and reassessed for implementation.

3.3.4. Wearing and Care of Compression Corsets

Wearing a compression corset after surgery helps to hold the breast reconstruc-

tion surgery in place, prevents the implant from shifting, helps to reduce swelling and hematoma, and reduces the risk of postoperative lymphoedema. Postoperative compression corset is to be worn consistently day and night for the first six weeks; daytime wear is to be worn from the seventh week onwards for a minimum of six months. Do not wear underwear with steel rings for 6 months to prevent deformation of the breasts and the occurrence of peritoneal twinning and peritoneal fibrosis. Wearing a medical corset need to pay attention to the degree of tightness, too tight can cause blood flow obstacles of the skin flap, and too loose is easy to appear under the skin flap fluid, resulting in the separation of the skin flap and chest wall is not conducive to healing. Tightness to accommodate a finger and breathing without pressure is appropriate.

3.3.5. Care of Post-Prosthetic Implant Massage

In order to avoid the complications of contracture, it is recommended to start breast massage 2 weeks after the operation (generally after the removal of stitches, the purpose of breast massage is to shape the perfect shape of the breast and prevent the contracture of the breast implant), and gradually increase the intensity of the massage as the healing process is perfected. Need to adhere to the massage every day, keep more than 3 months, surgery, adhere to the massage 1) is conducive to swelling recovery. Although the wound of the breast implant is not big, but it is also traumatic surgery, after breast augmentation massage can help blood circulation, and accelerate swelling 2) favorable moulding effect. Only after massage can they be made to get along with the breasts more harmoniously, facilitating the moulding effect. 3) Favors a more realistic softness, After the implantation of the breast, the fibrous tissue will wrap the implant, and if it is wrapped too firmly, it will be hard to touch from the outside, and only massage can relieve it and make the breast softer and more real [1].

3.3.6. Care during Radiotherapy after Breast Implant Surgery

Local radiotherapy reduces local recurrence and improves survival in breast cancer [9]. After radiotherapy, attention should be paid to keeping the skin in the radiation field of the anterior chest wall clean and dry, do not scratch with your hands, bathe with water, do not use irritating chemicals, and the water temperature should not be too high. If the skin markings are partially discolored after bathing, they should be traced promptly. As the affected limbs of breast cancer patients have different degrees of venous return obstruction after postoperative radiotherapy, there is a certain degree of oedema in the affected upper limbs, and the local skin resistance decreases, which easily affects the skin healing, so moderate functional exercises for the affected limbs are necessary. The patient can stand with hands on shoulders, a sitting position can elevate the affected side of the upper limb, lying position can be on the affected side of the upper limb under the soft pillow, these actions and postures can make the affected side of the upper limb is higher than the level of the heart position, to promote venous return. Next is diet, eat a more protein-rich diet, such as fish, meat, eggs, milk, etc., and should also supplement vitamins, and trace elements,

nutrition should be comprehensive. Eat more fresh vegetables and fruits.

4. Conclusion

Capsular Contracture is a common complication that typically occurs after breast augmentation and breast implant reconstruction surgery. Its prevalence varies in different studies and may range from 0 percent to 50 percent. Manifestations of pericontracture can include breast hardening, deformity, implant displacement, implant exposure, and skin necrosis. Several studies have pointed out that the development of Capsular Contracture is associated with several factors, one of which is excessive dilator water injection, the amount of water injected per dilator implantation is based on the patient's condition and the medical specialist's recommendation, so the amount of water injected is gradually increased from person to person, and usually not too much is injected at one time. The amount of water injected at any one time may range from a few tens of milliliters to a hundred milliliters, depending on the patient's condition. This helps the breast tissue to gradually adapt to the expansion and reduces the risk of Capsular Contracture. Post-expander implantation follow-up should be intensified with regular visits to the medical team to monitor the status of the breast and the risk of Capsular Contracture to ensure patient comfort and safety. With the development of medical technology and the improvement of social standards, the importance of the patient's body has gradually increased, so meeting the patient's body requirements while ensuring the effectiveness of treatment is the key to the treatment of breast cancer at present [10] [11] [12] [13] [14].

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Pan, X.H., Wu, Y.Q., Hu, W.H., *et al.* (2018) A Retrospective Study of Breast Massage to Prevent III/IV Capsular Contracture after Breast Augmentation with Prosthesis. *China Aesthetic Medicine*, **27**, 1-3.

[2] Wei, Y.G., Feng, W.L., Qin, S.T., *et al.* (2022) Research Progress on Risk Factors and Preventive Measures of Breast Prosthesis Contracture. Guangxi Medicine, **44**, 1911-1915.

[3] Yao, Y. and Mu, D.L. (2022) Research Progress on the Etiology and Prevention of Capsular Contracture after Immediate Prosthetic Breast Reconstruction. *Medical Review*, **28**, 2855-2860.

[4] Bresnick, S.D. (2021) Higher Prevalence of Capsular Contracture with Second-side Use of Breast Implant Insertion Funnels. *Plastic and Reconstructive Surgery-Global*

Open, **9**, e3906. https://doi.org/10.1097/GOX.0000000000003906

[5] Swanson, E. (2021) Open Capsulotomy for Capsular Contracture after Breast Augmentation: An Alternative Treatment Algorithm. *Plastic and Reconstructive Surgery*, **148**, 663e-665e. https://doi.org/10.1097/PRS.0000000000008343

[6] Li, D.Q. and Mo, Q.G. (2014) Progress in the Use of Expander in Breast Reconstruction after Breast Cancer Surgery. *Journal of Guangxi Medical University*, **31**, 338-340.

[7] Yao, L.J. and Shen, W.M. (2017) Research Progress on the Pathogenesis and Prevention of Capsular Contracture after Breast Augmentation with Prosthesis. *China Aesthetic Medicine*, **26**, 128-131.

[8] Liu, H.M., Yang, P., Bai, H.Y., *et al*. (2014) Effect of Radiotherapy on Stage I Expander Implantation and Stage II Prosthetic Breast Reconstruction in Breast Cancer. *Chinese Journal of General Surgery*, **23**, 1581-1583.

[9] Marques, M., Brown, S.A., Oliveira, I., *et al*. (2010) Long-Term Follow-Up of Breast Capsule Contracture Rates in Cosmetic and Reconstructive Case. *Plastic and Reconstructive Surgery*, **126**, 769-778. https://doi.org/10.1097/PRS.0b013e3181e5f7bf

[10] Chirstante, D., Pommier, S.J., Diggs, B.S., *et al*. (2010) Using Complicat Ions Associated with Postmastectomy Radiation and Immediate Breast Reconstruction to Improve Surgical Decision Making. *Archives of Surgery*, **145**, 873-878. https://doi.org/10.1001/archsurg.2010.170

[11] Eefy, S., Patani, N., Anderson, A., *et al*. (2010) Oncological Outcome and Patient Satisfaction with Skin-Sparing Mastectomy and Immediate Breast Reconstruction: A Prospective Observational Study. *BMC Cancer*, **10**, Article No. 171. https://doi.org/10.1186/1471-2407-10-171

[12] Whitfield, G.A., Horan, G., Irwin, M.S., *et al*. (2009) Incidence of Severe Capsular Contracture Following Implant-Based Immediate Breast Reconstruction with or without Postoperative Chest Wall Radiotherapy Using 40 Gray in 15 Fractions. *Radiotherapy & Oncology*, **90**, 141-147. https://doi.org/10.1016/j.radonc.2008.09.023

[13] Scherman, J.A., Hanasono, M.M., Newman, M.I., *et al*. (2006) Implant Reconstruction in Breast Cancer Patients Treasted with Radiation Therapy. *Plastic and Reconstructive Surgery*, **117**, 359-365. https://doi.org/10.1097/01.prs.0000201478.64877.87

[14] Kontos, M., Lewis, R.S., Lüchtenborg, M., *et al*. (2010) Does Immediate Breast Reconstruction Using Free Flaps Lead to Delay in the Administration of Adjuvant Chemotherapy for Breast Cancer? *European Journal of Surgical Oncology*, **36**, 745-749. https://doi.org/10.1016/j.ejso.2010.06.013