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Academic progress research on the prevention of surgical incision scar during surgical treatment of benign breast tumors

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Abstract: *Objective: This article summarizes the progress of surgical treatment of benign breast tumors and the prevention of incision scars during surgery. Methods: In this paper, the relevant research literature on the surgical treatment of benign breast tumors in China and the world was consulted, analyzed, and summarized. Conclusion: Many methods in this article can be used for scar treatment during the recovery period of surgery, and the success rate of these methods varies with different body constitutions. Since no single treatment modality is ideal for scarring, clinical management varies from individual to individual. The point of view of this article is that based on the basic principles of wound care, doctors need to be familiar with the problems that should be paid attention to in the process, from incision to scar, and handle the details of the operation preparation stage, operation process, and operation recovery period, and strive for ideal wound surface during the operation recovery period.*

Keywords: *breast benign tumor; surgical incision*

1. Introduction

With the improvement of living standards, the change in fertility concept, the increase of competitive pressure, and the intensification of environmental pollution, the incidence of breast diseases has been increasing year by year, especially breast cancer, which is a severe threat to life safety. Breast cancer is the most common cancer in women, accounting for more than one in ten new cancer diagnoses yearly. It is the second leading cause of cancer death in women worldwide [1]. A physical examination, imaging tests, especially mammograms, and tissue biopsies are necessary to diagnose breast cancer. Early diagnosis can improve survival rates. Tumors are prone to lymphatic and hematologic spread, leading to distant metastasis and poor prognosis. Accurate assessment of the risk of breast cancer in benign breast tumors is of great significance for guiding clinical treatment [2]. Its diagnosis and screening are usually performed with different imaging modalities such as mammography, magnetic resonance imaging, and ultrasound. Due to the higher resolution of MR images, among all available tools, MR images represent a method with higher specificity and sensitivity in lesion identification and diagnosis [3]. On the premise of complete resection of the tumor, the beauty of the surgical wound has always been the goal clinicians pursue. Scar prevention during the surgical recovery period must start from all aspects of the operation. An ideal scar has the same color as the surrounding skin in appearance and histologically. The surrounding skin is the same. This review will analyze the causes and prevention of various common tumors of the breast and the scar formation at each stage of surgery.

2. Common benign breast tumors

2.1 Breast fibroadenoma

The most common benign tumor of the breast, a fibroadenoma, is a painless, unilateral, benign (noncancerous) breast tumor that is a solid rather than fluid-filled mass. The lump is most common in women between 14 and 35, but it can be found at any age. Fibroadenomas shrink after menopause and are less common in postmenopausal women. Fibroadenomas are often referred to as mammary glands because of the high mobility of fibroadenomas. Afibroadenomais a marbled mass consisting of epithelial and stromal tissue beneath the skin of the breast. These complex, regularly-bounded rubber blobs often vary in size [4]. It is challenging to distinguish fibroids and cysts by clinical palpation, and ultrasonography is required for diagnosis. Suppose the imaging examination cannot confirm the

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diagnosis. In that case, a core needle biopsy should be performed for the mass, and resection is recommended if the surgical indication is more significant than 2 cm [5].

2.2 Intraductal papilloma of the breast

Intraductal papillomas are benign tumors found inside the breast ducts. Abnormal proliferation of ductal epithelial cells leads to growth. A solitary intraductal papilloma is usually located posterior to the center of the nipple and affects the central duct. Multiple intraductal papillomas are peripherally located and seen in any breast quadrant, affecting peripheral ducts. Intraductal papillomas can occur in women of all ages. Risk factors for breast cancer include contraceptive use, hormone replacement therapy, lifetime estrogen exposure, and family history. Symptomatic patients often present with spontaneous bloody or clear nipple discharge. Intraductal papillomas are occasionally palpable. However, most patients with intraductal papilloma are asymptomatic. Small intraductal papillomas usually have no symptoms or signs. Because intraductal papillomas may harbor underlying cancer, testing for them is essential. Due to its association with atypia, ductal carcinoma in situ, and carcinoma, it is classified as a high-risk precursor lesion. Surgical resection of the tumor is the recommended treatment [6]. Papillomas may appear as asymmetric hyperdense shadows on mammography or hypoechoic intraductal masses on ultrasonography. Related studies have found that contrast-enhanced ultrasound combined with mammography has a higher diagnostic value for the intraductal papilloma of the breast [7]. Other reports have noted a much higher rate of false-negative biopsies for benign papillomas, with rates as high as 19 percent for malignancy, 14 percent for progression, and 7.4 percent for malignancy, with some variation between ethnic groups[8]. Resection of papillomas confirmed by core needle biopsy is recommended [9]. High-risk lesions include papillomas larger than 1 cm and papillomas more than 3 cm from the nipple in patients over 50 years old [10]. All medical researchers agree that pathologically confirmed atypical hyperplasia should be resected.

2.3 Phylodes neoplasms of the breast

Phyllodes tumors are rare fibroepithelial breast neoplasms that behave differently according to their biology. Traditionally, benign, borderline, and malignant have been classified according to histological features. In most reported cases, all types may recur, but only borderline and malignant ones may metastasize. Its clinical features include well-circumscribed breast masses that are regular or lobulated. Diagnosis is based on the integration of morphological features with histopathological examination. In rare cases, the pathological examination requires further evaluation, and IHC is recommended for accurate diagnosis. In rare cases, the pathological examination requires further evaluation, and IHC is recommended for accurate diagnosis. Although malignant is rare, accounting for < 1% of all breast cancers, recommended diagnosis and treatment are based on reported cases.

Furthermore, when surgical resection is done, recurrence and distant metastasis rates are low, and adjuvant therapy may be unnecessary [11]. There is a report of a 36-year-old patient who had developed a large breast mass within the past 3–4 months with clinical and sonographic features of a phyllodes neoplasm of the breast. A core needle biopsy was obtained, confirmed benignity, and local excision were performed with no surgical recovery complications. Nevertheless, the final pathology report showed a borderline phyllodes tumor with a resection margin close to 1 mm. IHC diagnosis of malignancy with heterogeneous sarcomatoid differentiation. Its diagnosis can be difficult, mainly because it is easily confused with breast fibroadenoma [12].

2.4 Nipple discharge

Nipple discharge means any fluid leaking from one or both nipples of a non-pregnant and non-breastfeeding breast. Nipple discharge presents a complex diagnostic challenge for clinicians because nipple discharge can usually occur or manifest a variety of disorders. Each human breast has 15 to 20 milk ducts. Nipple discharge may originate from one or more of these ducts. The most important consideration for patients and physicians in patients with nipple discharge is the possible association of the condition with underlying breast cancer. As public awareness of breast cancer increases, more and more women are becoming aware of the problem. However, nipple discharge is not uncommon in the emergency department and may be benign (physiological discharge) or a sign of a pathological process [13]. Nipple discharge is the third most common breast disorder after breast pain and lumps. Nipple discharge occurs in 50% to 80% of women of reproductive age, 6.8% of whom are referred to a breast surgeon, and 97% of nipple discharge is benign [14]. The first step in evaluating breast discharge is to

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rule out whether the discharge is physiological or pathological. Physiological discharge is bilateral and clear or milky white. Pathological discharge is always unilateral and may be bloody. Therefore, it is essential to pay attention to the color of the discharge. In addition, the final diagnosis should be made based on the relevant symptoms. In patients with physiologic discharge, measure TSH and prolactin levels to rule out systemic causes of nipple discharge. For patients younger than 40 years of age, mammography is required. In patients with pathological discharge, ultrasonography is additionally required. If abnormal, a breast biopsy is done. If ordinary, a breast MRI is done, and if an associated mass is present, the mass is surgically removed. Liquid cytology can also be collected to study malignant cells in patients with nematodes [15]. Surgery has long been considered the standard of care, including total resection of the subareolar duct (major discectomy) or selective discectomy of a single affected duct (microdiscectomy). Micromastectomy has the benefit of preserving the remaining ductal system connected to the nipple and is usually the best option for young women wishing to breastfeed. In other cases, a large discectomy is preferred because of its higher detection rate of occult cancer than a microdiscectomy, resulting in fewer patients requiring repeat discectomy [16].

2.5 Breast fat necrosis

Fat necrosis of the breast is a benign disease, and pathogenesis is a non-suppurative inflammatory process of adipose tissue, which can occur after trauma, surgery, biopsy, breast reconstruction, fat grafting, radiation therapy, infection, and ductal dilatation appears next. Clinically, these patients may be asymptomatic or present with a palpable mass, skin constriction, induration, and occasionally axillary lymphadenopathy. Fat necrosis can have a highly variable appearance in different patterns as it develops, depending on when diagnostic imaging is performed. This is directly related to whether inflammation or fibrosis predominates in the lesion, and correlation with the clinical history is most important when evaluating these patients. The pathogenesis of fat necrosis begins with the destruction of adipocytes and a cascade initiated by the release of lipase, which may continue as an inflammatory process or progress to fibrosis. This process can be divided into four stages. (1) The hyperacute phase, vascular injury leading to the initial inflammatory response, is characterized by transient arteriolar vasoconstriction; (2) The acute inflammatory phase is a fibrin network triggered by endothelial injury activating the coagulation cascade; (3) Lipid (4) Phase IV includes a foreign body or chronic granulomatous reaction leading to irregular fibrosis or calcification [17]. Mammary fat usually does not require any surgical treatment. Surgical resection is an option if fat necrosis is confirmed and mammary fat does not cause pain or deformation of the breast shape [18].

3. Prevention of incision scar

3.1 Wound healing

Wound healingis a dynamic process that includes an inflammatory phase followed by epithelial cell proliferation and tissue remodeling. In normal tissues, the inflammatory phase is limited, lasting only 3-14 days. The initial phase of wound healing begins with the formation of tissue damage. The initial injury disrupts the vascular endothelium and exposes the basement membrane, leading to the immediate recruitment of neutrophils, which are subsequently replaced by macrophages and lymphocytes. Infiltrating leukocytes play a significant role in the secretion of inflammatory cytokines, growth factors, and chemokines that stimulate the proliferation of progenitor cells and the recruitment of keratinocytes and endothelial cells during the proliferative phase of wound healing. During this stage, granulation tissue is formed, angiogenesis is induced, and a new extracellular matrix is secreted. Epithelial cells undergo epithelial-mesenchymal transition and migrate to the wound edge to re-epithelialize the damaged tissue. During the final phase of wound healing, the maturation phase wound contraction, and differentiation of fibroblasts to myofibroblasts lead to scar tissue formation.

Furthermore, many diseases, including diabetes mellitus, compressive necrosis, and vasculitis, are associated with impaired wound healing [19]. The most common early sequelae in recovery from hand surgery for breast cancer include wound problems such as cellulitis, flap necrosis, abscesses, dehiscences, and hematomas. Appropriate management of these sequelae varies with severity: from mild cellulitis to overt abscesses, from micronecrosis of the margins to complete flap loss, or from minor swelling or abrasions to painful serum accumulation or symptomatic blood loss. These sequelae may unduly increase the risk of long-term morbidity [20].

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3.2 Factors in the preparation stage of surgery

Factors that affect surgical healing during surgery's recovery period include (1) psychological factors. Psychological stress affects sleep and rest, weakens the human body's ability to infect, lowers people's resistance, and mental stress affects cell vitality and wound healing; (2) surgical factors. In the environment, try to make the layout of the outpatient operating room reasonable, clean the operation first, and then carry out the disinfection and isolation of bacteria and aseptic operation separately in operation, and strictly aseptic operation to prevent wound infection; (3) age factor, age increases with age The growth of the disease leads to physiological and pathological aging, the patient's ability to cope with stress is weak, the internal environment of the body is in a relatively unstable and unbalanced state, the body's ability to adapt and resist diseases is weakened, and the ability of tissues to adapt to diseases is weakened. Repair and healing are weak. Poor wound healing or infection is the main factor affecting wound healing in elderly patients (4) Nutritional factors, lack of nutrition, will slow down metabolism, slow down the formation of new blood vessels, affect cell phagocytosis and immunity, and delay the healing of surgical wounds [21].

3.3 Factors during the operation

The management of incision scars is closely related to the phases of wound healing. In scar prevention, the essential variable factor is wound tension during the proliferative and remodeling phases, with high skin tension most closely associated with scar formation [22]. Studies have reported that prolonging the operation time will significantly increase the incision's infection rate during the operation's recovery period because prolonged exposure increases the chance of bacterial infection and aggravates tissue damage[23]. Furthermore, angiogenesis in routine wound healing relies on a delicate balance between promoting vessel growth and proliferation and promoting vessel maturation and quiescence. Nevertheless, the diabetic disease state significantly perturbs this balance, disrupting routine wound healing, tissue regeneration, and restoration of healthy vasculature [24]. Physical diseases can significantly affect wound healing in the recovery period of surgery, especially in diabetic patients, which will reduce the inflammatory response to injury and slow down epithelial formation, as well as cause neuropathy and vascular disease. Studies have confirmed that diabetic patients and ordinary people's Production of anti-angiogenic factors are now at higher circulating levels than [25].

3.4 Factors in the recovery period of surgery

Early prevention and control of infection during the recovery period of surgery is crucial, and maintaining a clean and sterile incision environment is the first step [26]. Relevant studies have proved that silicone gel sheets or silicone oil-based creams can effectively limit the hypertrophic growth of scars and are believed to reduce scar size by increasing hydration under the closure membrane and local skin temperature. The silicone sheet should be used for patients with infectious factors within two weeks of the hand surgery recovery period. The gel sheet was trimmed slightly larger than the scar and applied every two hours with a 30-minute rest period in between. The interval was gradually increased to 4 hours [27]. Some scholars compared the results of limb scars during the recovery period of patients who received microporous tape for their scars and those who did not receive microporous tape for their scars. Scars were assessed using the Patient and Observer Scar Assessment Scale at six weeks, three months, and six months during the hand surgery recovery period. The test group applied the microporous tape to the patients' scars and wore it 24 hours a day for six months. Replace it every two weeks or when it falls off. Microporous tape is an effective method for preventing abnormal scarring in patients recovering from surgery [28]. As one of the body's main lubricating compounds, hyaluronic acid is also a potential therapy for promoting wound healing [29]. To promote wound healing, hyaluronic acid is used as a topical agent because it is easily absorbed by soft tissues [30].

4. Conclusion

Choosing an effective and less destructive surgical method has become a complex problem for many surgeons. The resection method for benign breast lumps should be based on the individual wishes of specific patients, and an appropriate surgical treatment plan should be selected based on careful consideration of aesthetics, possible complications, size and location of the lump, and economic status.

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