Effectiveness of Ultrasound-Guided Minimally Invasive Spinotomy in the Treatment of Multiple Small Benign Breast Nodules

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Abstract: Objective: To observe the efficacy of different surgical protocols in the management of multiple benign breast nodules. Methods: Patients diagnosed with multiple benign breast nodules from 2021.4 to 2023.2 were divided into two groups, blank and study groups, each with 51 cases, and treated with conventional open and ultrasound-guided minimally invasive rotational surgery respectively. Results: The study group had better incision diameter and VAS score at 24h postoperatively than the blank group, with significant differences ($P < 0.05$). Regarding the postoperative complication rate index, the study group vs. the blank group was 3.92% vs. 21.57% ($P < 0.05$). Conclusion: Minimally invasive spinotomy under ultrasound guidance for the treatment of patients with multiple breast nodules is safe and effective and has the potential to be used universally.

Keywords: Small Benign Breast Nodules; Ultrasound Guidance; Minimally Invasive Rotational Surgery; Outcome Observation

Introduction

Nipple discharge and breast tenderness are common symptoms of multiple breast nodules, and tumours are a common causative factor for this disease. Although conventional surgery can remove the entire nodule, the operation is invasive and conceals a variety of factors that can increase the risk of post-operative complications and is not conducive to rapid recovery. Minimally invasive spinotomy effectively compensates for the shortcomings of the traditional procedure by applying a high-speed form of spinotomy to fully aspirate the diseased tissue of the lesion and extract the specimen intact, with the advantages of minimal trauma, minimal scarring and high precision [1]. In this paper, we compare the treatment of traditional open and minimally invasive spinotomy, and the medical records of 102 patients are extracted for the following analysis.

1. Data and methods

1.1 General information

The 102 patients included in this study were diagnosed according to preoperative imaging and postoperative histopathological examination, with clear indications for surgery, excluding those with pathological findings suggesting malignant nodules and those who withdrew midway. The selected patients were divided equally into two groups of 51 cases each, and the status of each group was as follows.

Blank group: age 19~51 (32.41±2.19) years, duration of disease 6~25 (15.24±2.09) months, nodule diameter size 0.5~2.3 (1.42±0.55) cm.

Study group: Age 18-54 (3.52±2.26) years, duration of disease 7-26 (15.58±2.22) months, nodule diameter 0.4-2.5 (1.55±0.61) cm.

The above information was comparable between the two groups of patients ($P > 0.05$). This subject was carried out after obtaining the approval of the ethics committee and the consent of the patients.

1.2 Methods

Traditional open surgery was used in the blank group. The lesion was located with colour ultrasound before surgery, and a 2~3 ㎝ incision was made above the diseased breast to remove the entire lesion according to the specific number of nodules to make the corresponding number of incisions. Traditional electrocoagulation was used to stop the bleeding, repair the subcutaneous tissue, close the incision with conventional sutures, and apply pressure bandages and antibiotics for 7 days after surgery.

The study group used minimally invasive spinotomy. The size, number and anatomical location of the nodules were clarified by ultrasound exploration before surgery and the surgical incision was marked. After local anaesthesia, an incision was made within 2 ㎝ of the nodule and an attempt was made to remove multiple tumours with one incision, and in exceptional cases through two incisions. The ultrasound instrument guides the stabbing of the rotary cutter up to the deep position of the nodule. The ultrasound image information is used with the rotary cutter system to effectively extract the breast nodule and perform the operations such as excision and rotary cut, clear away all the accumulated blood, stop the bleeding by means of local pressure, and disinfect the puncture site in strict accordance with the protocol. A sterile dressing was applied to treat the incision and the dressing was applied continuously for 5 to 7 d.

1.3 Observation indicators

(1) Surgery-related indicators: time spent on surgery, intraoperative blood loss, incision diameter, incision healing time, 24-h postoperative visual analogue (VAS) score.

(2) Post-operative complications.

1.4 Statistical processing

SPSS26.0 software processed the data, indicating surgery-related indicators, mean age, etc. The rate (%) indicated the complication rate, and X^2 was calculated. Test criteria: $P < 0.05$.

2. Results

2.1 Surgery-related indicators

The detection values of all surgery-related indexes in the patients of the study group were better than those of the blank group, and the data between the groups differed significantly and reached the level of significance ($P < 0.05$), Table 1.

Table 1 Comparison of surgery-related indicators between groups of patients $(\bar{x} \pm s)$

Group（n）	Surgery time（min）	Intraoperative blood loss（ml）	Incision diameter（mm）	Incision healing time（d）	VAS at 24h postoperatively（分）
Research Group（51）	18.79±1.59	5.31±1.07	2.58±0.44	2.84±1.09	2.59±0.46
Blank group（51）	33.06±5.17	12.11±1.59	27.14±6.04	4.69±1.34	4.22±1.01

2.2 Postoperative complications

The incidence of postoperative complications in the study group was lower than that in the blank group, and the difference was statistically significant ($P < 0.05$), as shown in Table 2.

Table 2 Comparison of postoperative complication rates between groups

Group（n）	Local haematoma	Infection	Skin pigmentation	Breast deformity	Total occurrence（%）
Research Group（51）	0	1	1	0	2（3.92）
Blank group（51）	3	4	2	2	11（21.57）

3. Discussion

Breast nodules are a common disease in the modern female population, most of them are benign, but a few are at risk of cancer. It is generally believed that there is a correlation between female endocrine disorders and the development of the disease, and that when the metabolism of progesterone and oestrogen is abnormally disturbed in the body, this can lead to breast hyperplasia. Breast nodules have become a physical and psychological disease that can have a huge impact on the patient's physical and mental state, inevitably reducing the quality of their daily life and work efficiency, and should therefore be treated symptomatically as soon as possible after diagnosis [2].

Currently, surgery is advocated for the treatment of multiple small breast nodules, but traditional open surgery, in which inspection, separation and excision are carried out under direct vision, rarely causes damage to other breast tissues, but the incision made under this procedure is long and the operations performed during surgery can cause greater damage to the patient. In this study, the time taken to perform the operation was less than one hour. In this study, the VAS scores for operative time, intraoperative blood loss, incision diameter, incision healing time and 24h postoperative were (18.79±1.59) min, (5.31±1.07) ml, (2.58±0.44) mm, (2.84±1.09) d and (2.59±0.46) respectively, while the values for the above indicators in the blank group were in the order of ((33.06±5.17) min, (12.11±1.59) ml, (27.14±6.04) mm, (4.69±1.34) d, (4.22±1.01) points, it is obvious that the patients in the study group had better treatment results. Minimally invasive spinotomy is a hollow-core biopsy tool that incorporates the principles of vacuum aspiration, electric cutting technology, the former allowing complete excision of the pathological tissue, and the latter removing the focal tissue with the assistance of a spinotomy knife and an internal jacket needle. In the specific cutting session, a vacuum suction pump extracts the pathological tissue in real time and transports it outside the body. Multiple lesions can be removed quickly, efficiently and safely using a single small incision under minimally invasive rotary incision [3]. Compared to traditional open surgery, the minimally invasive rotary incision is more discreet, has a smaller postoperative scar area, and has essentially no major impact on the appearance of the breast, gaining a high degree of certainty and acceptance among the patient population with breast nodules.

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