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Article

# Endoscopic Video-assisted Excision Combined with Mammotome for Major Benign Breast Lesions

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## Abstract

Background: It was difficult to excise major benign breast lesions more than 3 cm employing either Mammotome or Endoscopic respectively. Methods:From October, 2005 and October, 2008, 10 patients with major benign breast lesions underwent endoscopic, video-assisted breast excision combined with Mammotome in our institution. Cosmetic results were evaluated using the ABNSW scoring system. Results: The incision size was 1 to 1.8 cm. The operation time ranged from 30 to 55 minutes with a median of 41 minutes of all patients, from 38 to 55 minutes with a median of 45 minutes of 6 patients with rigid mass and from 30 to 36 minutes with a median of 30 minutes of 4 patients with flexible mass. The median total ABNSW score was 14.1 points, median intraoperative bleeding was 17 ml, and median cost was 7825 ￥. No clinically important complication was encountered, and all patients were extremely satisfied with the cosmetic results of the procedure. Conclusion: Video-assisted endoscopic resection combined with Mammotome is a safe, effective technique to treat major benign breast tumors, and provides esthetic advantages.

**Keywords:** Benign breast lesions; Video-assisted breast surgery; Mammotome; Cosmetic outcome

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## Introduction

Extirpation is the unique radical treatment for benign breast mass which is the most common disease in women. Conventional incision is made directly in the breast where the tumor is located and the postoperative cosmetic results are not considered. However, the majority of patients with a benign breast mass, such as a fibroadenoma or benign phyllodes, are adolescents, and thus the length and position of the scar is a bigger concern for them than the cost, operation time, or degree of difficulty of the resection.

In the last decades, some minimally invasive breast surgery using Mammotome ( X-rays or ultrasound guided vacuum-assisted breast biopsy system) or Endoscope has been applied to ablate benign breast mass for shortening or concealing the incision. Although Ultrasound-guided Mammotome procedure can provide a safe, feasible, accurate and minimally invasive excision for benign breast mass, it is limited when excising mass more than 3 cm (centimeter) because poor ultrasound view with large fluid collection and increased edema would affect the monitoring of residual lesions at the removal site, and the current indication for Mammotome excision is benign breast masses less than 3 cm [1-3].

Since the mid-1990s, endoscopic surgery has been applied to the field of breast surgery, early experience has demonstrated good esthetic outcomes for endoscopic extirpation of benign breast tumors by the transaxillary approach, or via extra-mammary incisions [4–7]. More recently, Yamashita and Shimizu [8, 9] reported a new endoscopic, video-assisted breast surgery (VABS) that has two main advantages compared to earlier endoscopic surgery: (1) working space is created by the retraction method rather than $CO_2$ expansion, so pulmonary embolism and subcutaneous emphysema would be totally avoided; (2) almost all surgical procedures are performed through a small axillary or periareolar incisional port instead of three incisions. However, how to take out some rigid masses exceeding 3 cm from a 1 to 1.5 cm incision remains a problem, and it is difficult and time-consuming to cut it in a bag in the subcutaneous space [7].

Our surgical group has adopted a new method of endoscopic resection of benign breast masses more than

3 cm combining Mammotome and VABS. This is the first series of minimally invasive breast surgery focus on major benign breast masses (diameter > 3 cm) reported up to date, our novel approach achieved scar-free breasts with good to excellent cosmetic results.

## PATIENTS AND METHODS

### Patients

Endoscopic, video-assisted resection of major benign breast masses combined with Mammotome was performed on 10 patients between October 1, 2005 and October 1, 2008 at the General Surgery Department of Shanghai Chang Zheng Hospital, Second Military Medical University in China. The patients' age ranged from 18 to 38 years old with a median of 28 years. All patients were subjected to routine preoperative evaluation with history taking, physical examination, mammography, magnetic resonance imaging and ultrasonography. Then, BI-RADS [10] (the Breast Imaging Reporting and Data System of the American College of Radiology) category was performed for every patient, and needle aspiration cytology was performed to confirm benign lesions once BI-RADS ranged from 3 to 6.

The majority of patients came to us for a second opinion as they did not want to have an incision scar on the breast as long as the tumor. Informed consent that included the following explanation was obtained before the operation: (1) this procedure is a new option to improve the cosmesis after treatment for benign breast tumors, (2) the size of the incisions are much smaller than in previous procedures and the breast can thus avoid any visible scar, (3) general anesthesia is required, (4) the operation time may be longer than a direct excisional biopsy because of narrower vision and special technique, (5) the patient is obliged to stay in hospital on the operation day at least, and (6) the cost is approximately fourfold as much as for direct biopsy owing to the need for general anesthesia and hospitalization. All operations were conducted by the same surgical team, including a skilled surgeon experienced in breast surgery along with a radiologist experienced in ultrasound breast imaging. The study was registered with the hospital audit department and obtained ethical approval.

### Surgical procedure

The patient was placed in the supine position under general anesthesia. The upper limb on the operative side was raised and abducted. Video monitors were set on both the sides of the patient's head and were watched by 2 surgeons. The endoscopic monitoring system is a product of the Olympus Optical Co. (Tokyo, Japan). The endoscope is rigid and straight, 5 mm in diameter, and oblique at $30^{o}$.

The skin incision was made along wrinkles in the axilla except the tumor was near the nipple or in the medical or inferior part of the breast that the periareola incision was made. A thin skin flap was constructed by the tunnel method [11]. Multiple parallel tunnels were created at intervals of 1 cm at the fixed depth of the subcutaneous tissue by blunt thrusting of the 10 mm-diameter endoport (OptiView). The blood vessels were observed to be collected in the septa between the penetrated tunnels. These septa were cut with a harmonic scalpel, which could easily coagulate and cut the vessels in the septa. The skin was pulled up with the Ultra Retractor with an endoscope and a suction tube to create a sufficient working space and to evacuate mist and smoke. Then the mammary gland was partially removed with a free surgical margin 1 cm away from the tumor edge with the harmonic scalpel under ultrasound-guidance and laparoscopic aid. The flexible resected mass was pulled out directly through the incision, while the rigid mass was taken out using Ultrasound-guided Mammotome (Ethicon, Endo-Surgery, Cincinnati, Ohio). Under real-time ultrasound guidance, the 8-gauge vacuum-assisted device was passed through the skin incision and positioned just beneath the ultrasound lesion and multiple 8-gauge cores were consecutively harvested while sequentially rotating the 8-gauge vacuum-assisted device over an array spanning approximately 180 degrees. (Fig. 1) Postoperative ultrasound was provided after 15 minutes to check if there was residual lesions. Frozen-section examination was routinely carried out during operation, and all cases were demonstrated benign lesions.

### Postoperative esthetic evaluation

To evaluate esthetic results, we adopted the ABNSW scoring system developed by Yamashita and Shimizu [9]. It is a five-item, four-step instrument modified from the earlier MDACS grading system based on evaluation of malposition, distortion, asymmetry, contour deformity, and scarring. Scoring of items according to the four steps includes grades of "excellent" 3 points, "good" 2 points, "fair" 1 point, and "poor" 0 points. Scores of the five items are combined to obtain a total score; a total score of 15 points is excellent, 11–14 points is good, 6–10 fair, and <5 poor. Scores for ABNSW items were determined through oral interview and evaluation of each patient.

## RESULTS

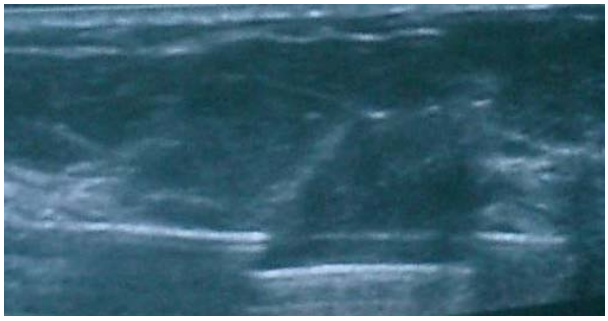

**Fig. 1** A palpable (4.1 cm in diameter) mass in a 36-year-old woman. When the 8-gauge cores had harvested half of the lesion, the imaging showed no sign of haematoma or fluid collection in the cave.

**Table 1.** Patient characteristics and surgical data

| | Variables | Statistics | | Variables | Statistics |
|---|---|---|---|---|---|
| 1 | Age (years) | 28 (18, 38) | 12 | Breast shape score | 3.0 (2.0, 3.0) |
| 2 | Gender | | 13 | Nipple shape score | 3.0 (3.0, 3.0) |
| 3 | female | 8 (80%) | 14 | Skin condition score | 3 (2.6, 3.0) |
| 4 | male | 2 (20%) | 15 | Wound scar score | 2.4 (2.0, 3.0) |
| 5 | Lesion size (cm) | 4.4(3.6, 5.8) | 16 | Total ABNSW score | 14.1 (13.0, 14.7) |
| 6 | Incision (cm) | 1.5 (1.0, 1.8) | 17 | Pathology | |
| 7 | Operative times (min) | 41(30, 55) | 18 | Fibroadenomas | 6 (60%) |
| 8 | Flexible mass (4) | 30 (30, 36) | 19 | Liparomphalus | 2 (20%) |
| 9 | Rigid mass (6) | 45 (38, 55) | 20 | Gynecomastism | 2 (20%) |
| 10 | Intraoperative bleeding (ml) | 17 (10, 20) | 21 | Cost ( ￥ ) | 7825 (7360, 8540) |
| 11 | Asymmetry score | 3.0 (3.0, 3.0) | | | |

**Note:** Data are presented as median (interquartile range) for continuous variables and number (frequency) for gender and pathology.

**ABNSW:** asymmetry, breast shape, nipple shape, skin condition, and wound scars.

Study subjects included 8 female patients and 2 males. Patient characteristics and surgical data are presented in Table 1. The incision size was 1 to 1.8cm. The median lesion size was 4.4 cm ranged from 3.6 to 5.8. The operation time ranged from 30 to 55 minutes with a median of 41 minutes of all patients, from 38 to 55 minutes with a median of 45 minutes of 6 patients with rigid mass and from 30 to 36 minutes with a median of 30 minutes of 4 patients with flexible mass. The median total ABNSW score was 14.1 points (range, 13.0 to 14.7 points), median intraoperative bleeding was 17 ml (range, 10 to 20 ml), and median cost was 7825 ￥ (range, 7360 to 8540 ￥). 6 subjects (60%) were diagnosed with fibroadenoma, and 4 subjects (40%) were diagnosed with liparomphalus or gynecomastism. Postoperative 7-day follow-up showed that the wound scars were small without skin ecchymosis, no clinically important hematoma developed, no postprocedural infectious complication were encountered, and all patients were extremely satisfied with the cosmetic results of the procedure. Interval ultrasound surveillance was performed at a median of 6 months (range, 5–8 months) after the operation. It showed that all of the lesions had been removed accurately and thoroughly with a satisfactory cosmetic outcome. There was no nipple deviation or collapse and no gross changes in the breast.

## DISCUSSION

Breast diseases appear on conspicuous body surfaces. Surgical wound scars on the breast cause anxiety and discomfort because the beauty of the breast is important to women. We know that traditional breast surgery not only leaves scars on breast tissue but also sometimes produces long-lasting psychological responses on the minds of patients. Better cosmetic outcomes improve patients' quality of life after surgery. With current technology and techniques, we can apply endoscopic devices to treat neoplastic breast lesions and hide surgical wounds in an inconspicuous region, such as the axilla, with the aim of achieving satisfactory cosmetic results.

Endoscopic surgery, established for abdominal and thoracic diseases [12, 13], has been applied to breast surgery as well. Kitamura [4] et al. first reported successful extirpation of a giant fibroadenoma of the breast in a 20-year-old woman, using a 3-mm or 10-mm endoscope and a 3-mm or 5-mm endoscopic device with a transaxillary approach in 1998. Subsequently, they [7] performed endoscopic extirpation of benign breast tumors in 36 patients using an extramammary approach from 1998 to 2001, the mean mass size was 3.6 cm, the average operation time per mass was 2.6 hours in the first 18 operations and 1.4 hours in the latter 19 operations, and

postoperative complications were seen in 2 patients: an extended subcutaneous emphysema due to excessive $CO_2$ gas inflation and a mild burn. More recently, Yamashita and Shimizu [9] reported a new endoscopic, video-assisted breast surgery (VABS) performed for 100 patients (18 benign lesions, 82 malignant lesions), and they concluded that the VABS technique was a surgical option that offered esthetic advantages for patients with varying types of breast disease, including benign breast tumors. Liu et al. [14] adopted it in 18 patients with 20 benign breast lesions from extramammary approach in recently, they reported that the median resected lesion size was 3.3 cm (range, 2.9, to 3.9) and the median operative time was 85.0 min. Kitamura [4] et al. and Liu [15] et al. all noted that the critical factors of the operation time were number and size of tumor except for technical skill. When a mass was less than 3 cm, it could easily be pulled out through a 1.5 to 2.0 cm incision in diameter. Otherwise, it had to be cut in a bag in the minor subcutaneous space and then taken out of the breast piecemeal, which was difficult and time-consuming.

Burbank [15] et al. first successfully developed the Mammotome system in 1994. The system is able to accurately locate and obtain sufficient tissue for a pathologic diagnosis; furthermore, it can provide a safe, feasible, accurate and minimally invasive excision for benign breast mass less than 3 cm [16-19]. Mammotome excision has advantages of less operative time and cost, earlier recovery and minimal invasiveness compared with endoscopic extirpation of benign breast mass less than 3 cm, it should be the primary alternative to traditional breast surgery for patients with small benign breast mass(< 3 cm) in our opinion. Therefore, we considered VABS only if the breast mass of patient was more than 3 cm.

In our series, Mammotome was first used to taken out the rigid mass from the breast piecemeal after dissecting it from the peripheral tissue, and it was very easy and convenient. The operation time ranged from 38 to 55 minutes with a median of 45 minutes of 6 patients with rigid mass in our study, which was significant shorter than previously report. However, the total ABNSW score was more than 14 in 80% of patients (median total score, 14.1), which implied that good esthetic results can be obtained with this novel approach consistent with other endoscopic approaches, and the good cosmetic results and degree of patient satisfaction justified the time and effort spent to perform the procedure.

The primary limitation of our study was the small sample size. Future research may explore comparison of this novel technique with the conventional or other minimally invasive approach. In conclusion, we suggest that retromammary, video-assisted endoscopic resection combined with Mammotome is a safe, effective technique to treat major benign breast tumors, and provides esthetic advantages.

## References

1. Ko EY, Bae YA, Kim MJ, Lee KS, Lee Y, Kim LS. Factors Affecting the Efficacy of Ultrasound-Guided Vacuum-Assisted Percutaneous Excision for Removal of Benign Breast Lesions. J. Ultrasound Med. 2008; 27(1):65-73.
2. Tagaya N, Nakagawa A, Ishikawa Y, Oyama T, Kubota K. Experience with ultrasonographically guided vacuum-assisted resection of benign breast tumors. Clin. Radiol. 2008; 63(4):396-400. doi:10.1016/j.crad.2007.06.012
3. Nakano S, Sakamoto H, Ohtsuka M, Mibu A, Sakata H, Yamamoto M. Evaluation and Indications of Ultrasound-Guided Vacuum-Assisted Core Needle Breast Biopsy. Breast Cancer 2007; 14(3):292-296.doi:10.2325/jbcs.14.292
4. Kitamura K, Hashizume M, Kataoka A, et al. Transaxillary approach for the endoscopic extirpation of benign breast tumors. Surg. Laparosc Endosc. 1998; 8(4):277-279. doi:10.1097/00019509-199808000-00007
5. Kitamura K, Hashizume M, Sugimachi K et al. Early experience of endoscopic extirpation of benign breast tumors via an extra-mammary incision. Am. J. Surg. 1998; 176(3):235-238. doi:10.1016/S0002-9610(98)00143-3
6. Kitamura K, Inoue H, Kinoshita J, Sugimachi K. Endoscopic extirpation for benign breast tumor. Nippon Geka Gakkai Zasshi 2000; 101(8):535-538.
7. Kitamura K, Inoue H, Ishida M, Kinoshita J, Hashizume M, Sugimachi K. Endoscopic extirpation of benign breast tumors using an extramammary approach. Am. J. Surg. 2001; 181(3):211-214.doi:10.1016/S0002-9610(01)00562-1
8. Yamashita K, Shimizu K. Endoscopic video-assisted breast surgery: procedures and short-term results. J Nippon Med Sch 2006; 73(4):193-202. doi:10.1272/jnms.73.193
9. Yamashita K, Shimizu K. Video-assisted breast surgery: reconstruction after resection of more than 33% of the breast. J Nippon Med Sch 2006; 73(6):320-327. doi:10.1272/jnms.73.320
10. Burnside ES, Sickles EA, Bassett LW, et al. The ACR BI-RADS experience: learning from history. J. Am. Coll. Radiol. 2009; 6(12):851-860. doi:10.1016/j.jacr.2009.07.023
11. Tamaki Y, Sakita I, Miyoshi Y, et al. Transareolar endoscopy-assisted partial mastectomy: a preliminary report of six cases. Surg. Laparosc. Endosc. Percutan Tech. 2001; 11(6):356-362.
12. Perissat J, Collet D, Belliard R, Desplantez J, Magne E. Laparoscopic cholecystectomy: the state of the art: a report on 700 consecutive cases. World J. Surg. 1992; 16(6):1074-1082. doi:10.1007/BF02067064
13. McKneally MF, Lewis RJ, Anderson RJ, et al. Statement of the AATS/STS Joint Committee on Thoracoscopy and Video Assisted Thoracic Surgery. J. Thorac Cardiovasc Surg. 1992; 104(1):1.
14. Liu H, Huang CK, Yu PC, et al. Retromammary Approach for Endoscopic Resection of Benign Breast Lesions. World J. Surg. 2009; 33(12):2572-2578. doi:10.1007/s00268-009-0225-x
15 Burbank F, Parker SH, Fogarty TJ. Stereotactic breast biopsy improved tissue harvesting with the Mammotome. Am. Surg. 1996; 62(9):738-744.
16. Grady I, Gorsuch H, Wilburn-Bailey S. Ultrasound-Guided,Vacuum-Assisted, Percutaneous Excision of Breast Lesions: An Accurate Technique in the Diagnosis of Atypical Ductal Hyperplasia. J. Am . Coll. Surg. 2005; 201(1):14–17doi:10.1016/j.jamcollsurg.2005.02.025
17. He Q, Fan X, Guan Y, Tian J, Fan Z, Zheng L. Percutaneous excisional biopsy of impalpable breast lesions under ultrasound visualization. Breast 2008; 17(6): 666-670. doi:10.1016/j.breast.2008.08.004
18. Iwuagwu O, Drew P. Vacuum-assisted biopsy device—diagnostic and therapeutic applications in breast surgery. Breast 2004; 13(6):483-487. doi:10.1016/j.breast.2004.06.004
19. Fine RE, Whitworth PW, Kim JA, Harness JK, Boyd BA, Burak WE Jr. Low-risk palpable breast masses removed using a vacuum-assisted hand-held device. Am. J. Surg. 2003; 186(4):362–367. doi:10.1016/S0002-9610(03)00263-0