Original Article

Experience of Stereotactic Breast Biopsy Using the Vacuum-assisted Core Needle Biopsy Device and the Advanced Breast Biopsy Instrumentation System in Hong Kong Women

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BACKGROUND: Stereotactic breast biopsy of non-palpable lesions using the vacuum-assisted core needle biopsy (CNB) device and the large core excision biopsy system is a reliable biopsy method when compared with open biopsy. Its use in Western countries is well accepted. This study aimed to assess the feasibility and results of using these systems to perform stereotactic biopsy in Asian women.

METHODS: A total of 114 patients with non-palpable mammographic lesions underwent stereotactic breast biopsy using the vacuum-assisted CNB device and the large core excision biopsy system between November 1999 and December 2002. The indications for biopsy were mammographic abnormalities considered indeterminate or suspicious that were not palpable or visible on ultrasound. The methods adopted for biopsy in Asian women were reviewed and the results including the final pathology, complications, scarring and acceptance by patients were recorded.

RESULTS: Stereotactic breast biopsy was performed using the vacuum-assisted CNB device in 107 patients and the large core excision biopsy system in seven patients. Of those who underwent biopsy using the vacuum-assisted CNB device, 15 (14%) had moderate to severe bleeding during the procedure and seven (6.5%) had severe bruising afterwards. Carcinoma was detected in 31 of the 114 patients (27.2%).

CONCLUSION: Although Asian women in general have smaller and denser breasts than their Western counterparts, stereotactic breast biopsy using the vacuum-assisted CNB device and the large core excision biopsy system was feasible with modification of the individual steps during the procedure. Our results are comparable with those published previously and the procedure was well accepted by patients. [*Asian J Surg* 2005;28(1):18–23]

Key Words: stereotactic breast biopsy, vacuum-assisted core needle biopsy, Mammotome, ABBI

Introduction

The increasing use of mammography as a screening tool has resulted in more frequent detection of non-palpable mammographic abnormalities. Many methods have been used to manage these lesions, including stereotactic fine needle aspiration cytology (FNAC), core needle biopsy (CNB), vacuum-assisted CNB (Mammotome), large core excision biopsy (advanced breast biopsy instrumentation, ABBI) and open surgical wire-guided excisional biopsy.

Non-palpable mammographic abnormalities tend to be occult and heterogeneous, thereby increasing the false-

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negative rate of stereotactic FNAC.[1,2] Stereotactic CNB has a high diagnostic rate and could be an acceptable diagnostic procedure prior to open surgical biopsy.[3–6] Its accuracy depends on the number of cores taken and the size of the cores. Stereotactic 14-gauge core biopsy achieves 97% diagnostic accuracy with five cores obtained for each mammographic lesion.[7,8] The sensitivity of diagnosing malignancy increases with more cores taken.[9,10]

Vacuum-assisted CNB devices such as the Mammotome provide larger cores and multiple cores can be taken by turning the device and applying suction with only a single needle insertion, providing more tissue sampling and convenience in handling than automated CNB.[11–14]

The large core excision biopsy system (ABBI) provides a cylinder of specimen comparable with that from open excision biopsy.[15] It allows precision in the biopsy, overcoming the risk of hook wire migration with wire-guided excisional biopsy, and post-biopsy mammography can be undertaken immediately after the biopsy before releasing breast compression, to ensure correct removal of the abnormality.

Numerous reports have shown that the diagnostic accuracy using the vacuum-assisted devices and the ABBI system are comparable with that of excisional biopsy with minimal complication rates and good acceptance in Western women.[11,12,15,16] These systems were first introduced to Hong Kong at our Centre in November 1999. This study aimed to assess the feasibility and results of using these systems to perform stereotactic breast biopsy in Asian women with non-palpable mammographic lesions.

Methods

From November 1999 to December 2002, 4,954 symptomatic and asymptomatic women underwent mammography at the Hong Kong Sanatorium and Hospital. Women with non-palpable mammographic abnormalities were selected to undergo stereotactic breast biopsy in the Breast Care Centre, Hong Kong Sanatorium and Hospital. Indications for biopsy were architectural distortion, asymmetrical density, nodular opacity and microcalcifications. Patients with a target lesion less than 5 mm in diameter for which complete excision was contemplated were selected for large core ABBI breast biopsy and all other patients underwent vacuum-assisted CNB. Patients who had small breasts with compression thickness less than 2 cm, whose abnormalities were not visible on the stereotactic system, who could not tolerate the prone position or who had a lesion that was too superficial or too deep in the posterior wall were excluded from the procedure. For patients with abnormalities that were also visible with ultrasound, ultrasound-guided biopsy was performed instead.

The surgeon and radiologist discussed the approach to the lesion, choosing the shortest route and a skin entry site that could be comfortably included in future open surgery should cancer be diagnosed and avoiding areas that could produce unsightly scars. After the radiographer had positioned the patient, the radiologist targeted the lesion and the surgeon performed the biopsy.

The prone biopsy table system (LORAD MultiCare Prone Breast Biopsy System, A Hologic Company, Bedford, MA, USA) was used. Biopsies were done using the Mammotome (Ethicon Endo-surgery Inc, Johnson-Johnson Company, Cincinnati, OH, USA) or ABBI (United States Surgical Corporation, Norwalk, CT, USA).

Positioning

Patients were pre-medicated with valium 10 mg and mefenamic acid 500 mg per oral 1 hour before the procedure. They lay prone on the biopsy table. The breast to be biopsied hung down through the aperture of the table and was compressed by the window and the compression plate. Play-Doh® or Perspex® plates were used to stabilize the breast when the breast did not fill the 5 × 5 cm biopsy window because it was too small (Figure 1). The shoulder and arm of the patient were dropped through the table aperture when the lesion was deep in the posterior wall.

Targeting

The lesion was localized by taking stereotactic radiographs. The three-dimensional orientation of the lesion was calcu-

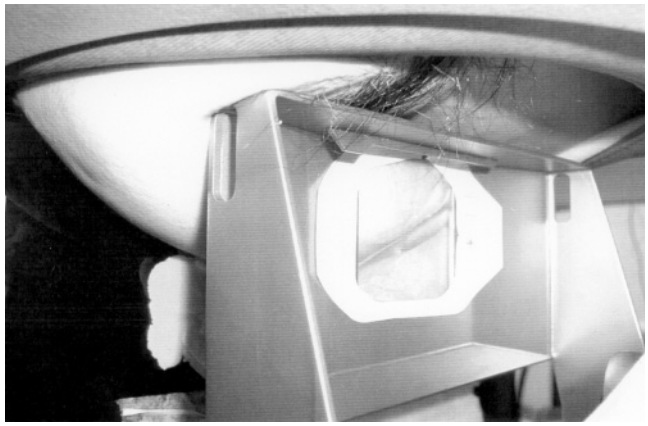

Figure 1. Play-Doh® and Perspex® plates used to stabilize the breast when the breast did not fill the 5 × 5 cm biopsy window because it was too small.

lated by computer system and lesions were approached by the shortest route. Local anaesthetic (3–5 mL of 1% xylocaine with adrenaline) was used to infiltrate the incision site and 1 cm away from the lesion at the four quadrants of the lesion to create a field block. Targeting was repeated after infiltration because we often experienced shifting of the lesion after infiltration of local anaesthetic.

Harvesting

For vacuum-assisted biopsy, a 5 mm incision was made and six cores per circumference were taken using an 8–11 gauge needle. Suction was applied while cutting the cores of breast tissue. One or more circumferences of tissue were taken depending on the size of the lesion.

For large core excisional biopsy, the localizing needle was guided to the lesion using a digital system through a small incision. After verifying the position of the needle, the T-fastener was deployed to fix the lesion in place. When the position of the T-fastener was confirmed by another set of stereotactic radiographs, further local anaesthetic was infiltrated and the incision was extended to a length 5 mm longer than the diameter of the biopsy cannula. We used a 15–20 mm cannula. The cylindrical cannula was advanced over the needle and the T-fastener while the oscillating, circular cutting blade cut the breast tissue. The cautery snare cut the tissue at the deep end of the cylinder; the specimen and the cylinder were then removed. Diathermy was used to stop the bleeding in the post-excision cavity.

After biopsy, specimen radiographs and post-excision mammograms were taken when the breast was still under compression. The severity of bleeding was observed during the procedure. It was considered minimal if bleeding at the biopsy site stopped spontaneously, mild if the bleeding was stopped by compression for 5 minutes, moderate if there was continuous oozing of blood at the end of the procedure and 5 mL of 1% xylocaine with 1 in 100,000 adrenaline flushing was used to stop the bleeding, and severe if either further diathermy or insertion of a silicon drain was used. Postoperative bruising was assessed 1 week after the procedure. It was considered minimal if there was no bruising, mild if there was visible ecchymosis of the skin, moderate if the area of bruising was less than a quadrant of the breast, and severe if the area of bruising was larger than one quadrant of the breast. The scar was noted 1 month after the procedure, when the patient's acceptance of the procedure was also recorded. All patients with benign pathology underwent follow-up mammography 6 months after the procedure.

Results

Overall, 114 patients underwent stereotactic-guided breast biopsies between November 1999 and December 2002. Patient age ranged from 33 to 77 years (median, 47 years). Vacuum-assisted CNB was performed in 107 patients and ABBI in seven patients. Indications for biopsy were architectural distortion in one patient, asymmetrical density in six patients, nodular opacity in three patients and microcalcifications in 104 patients. The thickness of compression ranged from 24.6 to 65.8 mm; half of the patients had a compression thickness of less than 41.4 mm. The duration of the procedure ranged from 30 to 128 minutes (median, 68.5 minutes). The approach to the lesions was superior in nine patients, inferior in eight, lateral in 67, medial in seven, medial lateral oblique in 12 and not recorded in 11 patients in which the shortest route was taken.

All lesions with microcalcifications were successfully identified on the specimen radiograph and were shown to be removed in mammograms immediately after the procedure (Figure 2). Pathologies included invasive ductal carcinoma, ductal carcinoma *in situ*, fibrocystic change with focal mild atypical ductal hyperplasia, fibrocystic change, sclerosing adenosis, mucocele-like tumour, fibroadenoma, radial scar, intramammary lymph node and intraductal papilloma (Table 1). Malignancy was detected in 31 of the 114 patients (27.2%).

The severity of bleeding, bruising and scarring is shown in Table 2. The age of women with severe bleeding ranged from 42 to 52 years: five of the women were younger than 45 years. Haematoma was found in one patient and a small raised scar was detected in seven patients. Bruises and scars were not recorded for 35 patients (Table 2).

Diathermy was used to achieve haemostasis in all patients who underwent stereotactic large core biopsy. Six of these

Figure 2. Stereopair mammogram of microcalcifications with the Mammotome in the breast.

Table 1. Histological diagnosis from stereotactic core needle biopsy and large core excisional biopsy

Pathology identified	*n* (%)
Invasive ductal carcinoma	2 (1.75)
Ductal carcinoma *in situ*	29 (25.44)
Fibrocystic change with focal mild atypical ductal carcinoma	10 (8.77)
Fibrocystic change	61 (53.51)
Mucocele-like lesion	4 (3.51)
Fibroadenoma	3 (2.63)
Sclerosing adenosis	2 (1.75)
Intramammary lymph node	1 (0.88)
Intraductal papilloma	1 (0.88)
Radial scar	1 (0.88)
Total	114

patients had no bruising and one had minimal bruising. Mild linear scarring was detected in all these patients.

No other serious complications were encountered. The biopsy was a day-surgery procedure. All patients were fit for discharge 2–3 hours after the procedure. All of them considered the procedure acceptable without undue discomfort. Only a few mentioned mild neck pain in the prone position.

Discussion

A number of biopsy techniques and devices are currently used to deal with non-palpable mammographic abnormalities. Because of the occult nature and heterogeneity of mammographic non-palpable lesions, stereotactic FNAC has tended to be inaccurate.[1,2] Stereotactic CNB using the automated gun is accurate when compared with open biopsy, but multiple passes are needed to obtain an adequate number of cores. As the accuracy rate is related to the number and the size of the cores,[7–10] vacuum-assisted CNB yields larger and more cores with only one pass and is also well tolerated by patients.[11–14]

The ABBI system provides a cylinder of tissue for pathological examination; pathologists find this sample similar to interpret to samples from open surgical biopsy. The wound in the breast is predictable from the size of the cylinder used, although the location of the wound is always peripheral and is governed by the approach taken. The removal of the whole lesion can be confirmed by specimen radiography and post-biopsy mammography in the same setting. Patients can be assured that the abnormalities are successfully biopsied from mammography before releasing breast compression.

Asian women have smaller breasts than their Western counterparts. Unpublished data collected in 2,257 women attending the Breast Care Centre, Hong Kong Sanatorium and Hospital, for screening show that the compression thickness ranges from 0.5 to 9.0 cm (median, 4.59 cm). The brassiere size is below 75 cm in 65% of women; 46.9% of women have cup size A and 43.7% cup size B. Therefore, a number of positioning techniques were used to facilitate biopsy in small breasts. Play-Doh® and Perspex® plates were used to completely fill the biopsy window in patients with small breasts. This allowed compression from all sides of the biopsy window and, thus, reduced the possibility of movement and increased the stability of the breast for needle insertion. When the lesion was deep in the chest wall, the arm could be lowered through the table aperture. This allowed more posterior breast tissue to be visualized through the biopsy window.[17,18]

Besides the size of the breast, density is another important issue that we need to consider when biopsying Asian women. In our experience, infiltration of local anaesthetic can shift the x-, y- and z-axes of the lesion in the dense breast tissue instead of diffusing out evenly (Table 3). Retargeting is therefore very important before making a skin nick and advancing the core needle device through the skin.

The tendency to bleeding from breast tissue appears greater in Asian women than Western women. Fuhrman et al reported that only minor ecchymosis is encountered in image-guided breast CNB.[19] However, in our study, 15 patients (13.2%) who underwent stereotactic vacuum-assisted CNB experienced moderate to severe bleeding. Only one patient who had severe bleeding was older than 50 years; the other patients were

Table 2. Severity of complications

Outcome of procedure	*N*	Nil/minimal, *n* (%)	Mild, *n* (%)	Moderate, *n* (%)	Severe, *n* (%)
Bleeding	114	62 (54.4)	37 (32.5)	9 (7.9)	6 (5.3%)
Bruising	79	46 (58.2)	25 (31.6)	5 (6.3)	3 (3.8%)
Scarring	79	40 (50.6)	32 (40.5)	7 (8.9)	0

Table 3. Shifting of axis after infiltration of local anaesthetic in one patient

Axis	Before infiltration of local anaesthetic	After infiltration of local anaesthetic
x	–3.7	–7.4
y	18	16.5
z	29.1	30.9

younger than 45 years. This may be because the density of breast tissue is higher in Asian and younger patients. In four patients who had severe bleeding, drains were inserted. One of them had severe bruising, one had no bruising, and the other two had moderate bruises. However, one patient who had mild bleeding without any drain insertion developed haematoma. It is our experience with open breast biopsy that severed vessels within the breast are held by the dense breast tissue and, therefore, do not constrict well to achieve haemostasis and often require diathermy haemostasis. Pressure dressing without diathermy haemostasis in our patients often led to extensive bruising. We therefore routinely use adrenaline in our local anaesthetic and also recommend the use of diathermy for control of bleeding when necessary.

Due to the possibility of keloid formation in Asians, we are very cautious when choosing the site of skin entry for biopsy to avoid unsightly scars, especially in the upper and medial part of the breast. Also, as most Asian breast sizes are either a cup A or B, there is not much excess skin around biopsy sites. Therefore, the skin entry site for biopsy needs to be carefully planned in order to facilitate inclusion of the biopsy tract in future surgery should cancer be diagnosed. This led us to perform most of our biopsies through a medial-lateral approach. In vacuum-assisted CNB, the initial wound was 5 mm, but most of the scars shrank to 3 or 4 mm by 6 months after the procedure and appeared like a spot of pigmentation (Figure 3).

The duration of the procedure was acceptable as most were completed in less than 1 hour. As patients could lie comfortably on the prone table, most considered this procedure to be acceptable. The prone position could also prevent vasovagal attack, which can occur when the procedure is done in the upright position.[20]

In this study, 27% of patients were found to have malignancy. This figure is comparable with those from other studies.[11,21] This shows that stereotactic breast biopsy is feasible in Asian women with strict selection criteria, achieving comparable results and acceptable complication levels.

Figure 3. Shrinkage of the wound 6 months after biopsy.

Conclusion

Stereotactic breast biopsy using the vacuum-assisted CNB device and ABBI is feasible in Asian women with mammographic abnormalities. Modifications to the biopsy technique were made to suit the smaller and denser breasts of Asian women.

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