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Wire-guided excision of mammographic abnormalities

線導切除乳房異常物病例的回顧

Objective. A review of wire-guided excision of abnormal lesions viewed on screening mammography.
Design. Retrospective review.
Setting. Regional hospital, Hong Kong.
Patients. Patients who underwent wire-guided excision of abnormalities visualised on screening mammography between 1999 and 2002.
Intervention. Wire-guided excision.
Main outcome measures. Biopsy rate and positive biopsy rate.
Results. A total of 65 patients underwent wire-guided excision of an abnormal lesion previously identified by screening mammography. Twenty-one were benign, two were lobular carcinoma in situ, and 42 were malignant. Of the latter, 30 were identified as ductal carcinoma in situ, and 12 as invasive breast cancer. Thirty-eight of the 42 malignant cases required further treatment, and 24 of them underwent further operation. Radiological assessment of the 65 patients suggested that nine lesions were probably benign, 31 indeterminate, 20 suspicious, and five malignant. Malignancy was subsequently confirmed by histological examination in 6, 20, 13, and 3 cases of the respective group of radiological assessment.
Conclusion. The biopsy rate was approximately 3.7 per 1000 screened women, with results benign in 1.19 per 1000. The positive biopsy rate was 64.6%, and invasion was evident in 28.6%.

目的：在乳腺X射線造影篩查中發現異常病變組織之後，檢視有關線導切除乳房異常物的病例。
設計：回顧研究。
安排：地區醫院，香港。
病者：1999 至 2002 年間，在乳腺 X 射線造影篩查中發現有異常物之後以線導技術予以切除的病人。
療法：以線導技術切除。
主要結果測量：活檢率和呈陽性反應的活檢率。
結果：共65位病人接受乳腺X射線造影篩查後發現有異常物並施以線導技術予以切除。其中 21 位的異常物屬良性， 2 位患原位小葉癌， 42 位屬其他惡性腫瘤。 42 位患有惡性腫瘤的病人中， 30 位診斷為患上原位導管癌，12位為浸潤性乳腺癌，其中38人需要接受進一步治療，當中24位要再接受手術。放射檢查結果顯示，有9個病人的病變組織可能為良性，31個屬未能定性，20個屬懷疑個案，5個為惡性。在以上四組病人中，順次地分別有 6 、 20 、 13 及 3 位的病變組織之後被確診為惡性。
結論：活檢率大約為每1000位接受篩查的女性中有3.7個，檢查結果屬良性的有1.19 個，呈陽性反應的活檢率為64.6%，有擴散跡象的佔28.6%。

Key words:
Biopsy;
Breast diseases;
Breast neoplasms;
Mammography

關鍵詞：
活檢率；
乳房病症；
乳房腫瘤；
乳腺 X 射線造影術

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Introduction

Breast cancer is the most common malignancy among women in Hong

Kong, with a lifetime risk of 1:23.[1] The most common symptom is a palpable breast lump. Mammography is able to detect early lesions that are not clinically palpable.

Mammography has been extensively used to investigate breast symptoms. However, a public-funded, population-wide mammography screening programme has not been set up in Hong Kong. Women's Health Centres, run by the Department of Health, offer screening mammography for women above 50 years of age. Well Women Clinics, run by the Tung Wah Group of Hospitals, offer screening mammography for women above 40 years of age. This service is also readily available at private hospitals and laboratories.

As the use of mammography increases, the number of lesions detected also increases. Mammographic lesions are graded according to the degree of suspicion of malignancy. Most abnormalities are graded as benign, thus no further intervention except follow-up is needed. In lesions graded as indeterminate or suspicious of malignancy, tissue biopsy is required for histological examination.

Microcalcifications are usually localised using a stereotactic technique and, preferably, ultrasound guidance.[2,3] Core biopsy is generally carried out percutaneously because it provides a minimally invasive approach that does not require expensive disposable instruments. In selected cases, vacuum-assisted suction biopsy Mammotome (Ethicon Endo-Surgery, Cincinnati [OH], United States) is used to acquire a larger amount of tissue for histological examination. Wire-guided excision is performed when other biopsy methods cannot give a definitive diagnosis. It is also used for therapeutic purposes in cases of atypical ductal hyperplasia (ADH), ductal carcinoma in situ (DCIS), or invasive carcinoma.

The aim of this study was to review the results of wire-guided biopsy and to determine whether the current algorithm of management should be amended in view of the increasing use of the Mammotome for biopsy.

Patients and methods

Between April 1999 and March 2002, 65 wire-guided breast excisions were performed in 65 Chinese patients at Kwong Wah Hospital whose screening mammograms were abnormal. Forty-four (67.7%) patients were referred by Well Woman Clinics, and the remaining were by Department of Health centres or private practitioners. All films were first reviewed by a single radiologist specialised in breast imaging. Abnormal mammograms were then jointly reviewed by two radiologists. Mammographic abnormalities were graded according to the National Health Service Breast Screening Programme (NHSBSP) system. The decision to perform wire-guided excision was based on the consensus of the radiologists and surgeon.

On the morning of surgery, a wire (Echo-Coat; STS Biopolymers, Henrietta [NY], United States) was inserted under local anaesthesia by a radiologist, who then reviewed the initial mammogram to ascertain the location of the lesion and to design the approach of the localisation wire. The shortest route was usually chosen to facilitate biopsy. The lesion was localised stereotactically using a prone table or an add-on unit of a conventional mammography machine. Position of the guidewire was confirmed radiologically, and an additional wire was inserted if the initial wire missed the target. The wire was taped to avoid migration while the patient was being transferred to the operating theatre.

Surgery was performed under general anaesthesia. The adhesive tape was removed, and the wire was cut a few centimetres from the skin entry site. The location of the wire tip was mapped using the post-insertion films. Skin incision was centred over the tip of the wire rather than its entry site, and a skin flap was elevated using diathermy. The plane of dissection was the subcutaneous fat above the breast parenchyma. For diagnostic biopsy, a 2-cm disc of breast tissue surrounding the wire tip was removed. The specimen included the pectoralis major fascia and the muscle was exposed in all cases. The specimen was orientated using stitches and metal clips before dispatching to the Department of Radiology for specimen mammogram. After complete removal of the index lesion, the specimen was fixed with formalin and sent for paraffin section. Frozen section was not performed. If the initial mammogram did not confirm presence of the index lesion or the margins were inadequate, further excision was performed. Following excision, the tumour bed was marked with metal clips for future identification, and the wound was closed in layers with absorbable sutures. The patient was discharged on the first postoperative day.

Results

Mastalgia was reported by three patients whereas a breast lump or feeling of lumpiness by eight. The remaining 54 patients reported no symptoms. No definitive lumps were detected on physical examination or ultrasound in any patient. Nodularity was detected in 12 patients. Both symptoms and physical findings of

Table 1. Correlation of mammographic findings and final pathology

Mammographic findings	No. of cases (n=65)	No. of confirmed malignancy (n=42)
Microcalcifications	45	33
Densities	12	4
Mixed lesions	8	5

Table 2. Correlation of fine needle aspiration cytology and final histology

Grading	Aspiration cytology (n=28)	Histologically malignant (n=18)
Benign	8	3
Indeterminate	1	0
Malignant	15	14
Insufficient	4	1

Table 3. Correlation of core/Mammotome biopsy and final histology

Diagnosis	Core/Mammotome biopsy (n=38)	Final histology of confirmed malignancy (n=26)
Normal	6	3
Benign	7	3
Malignant	13	13
Atypical ductal hyperplasia	9	5
Papillary lesion	2	1
Insufficient	1	1

Table 4. Correlation of radiological grading of mammography and final histology

Radiological grading	No. of cases (n=65)	No. of confirmed malignancy (n=42)
Probably benign	9	6
Indeterminate	31	20
Probably malignant	20	13
Malignant	5	3

nodularity did not correspond to a final diagnosis of malignancy. The final pathology of the patients consisted of 21 benign lesions, two lobular carcinoma in situ, 30 DCIS, and 12 invasive breast cancers.

Mammographic findings revealed 45 microcalcifications, 12 densities, and eight mixed lesions (density associated with microcalcification). Of which 33, 4, and 5 respectively were later confirmed to be malignant (Table 1).

Preoperative biopsy was performed in 58 patients: 20 had fine needle aspiration performed alone, 30 had core biopsy alone, and eight had both biopsies. Seven patients underwent wire-guided biopsy without preoperative cytology or histology.

Of 28 patients undergoing fine needle aspiration, specimens of four (14.3%) were insufficient for diagnostic purposes, one was indeterminate, 15 yielded suspicious or frankly malignant cells, and the remaining eight were benign. Fourteen of the 15 malignancies were subsequently confirmed by wire-guided biopsy, and the positive predictive value was 93%. Three of eight lesions that had benign cytology were later confirmed malignant (Table 2).

Thirty-eight patients underwent stereotactic core/Mammotome biopsy: one (2.6%) specimen considered insufficient for diagnostic purposes was subsequently proved malignant. Six specimens contained only normal breast tissue, three of which were later confirmed by wire-guided excision to be DCIS. Seven were considered benign, but two invasive cancers and one DCIS were subsequently confirmed by excision. Nine were diagnosed with ADH, and wire-guided biopsy subsequently confirmed five DCIS. All 13 malignant diagnoses were subsequently confirmed by final pathology. One of the two papillary lesions was malignant (Table 3).

The correlation between the mammography grading and the pathological diagnosis is shown in Table 4. Nine cases were radiologically graded as probably benign, 31 indeterminate, 20 suspicious, and five malignant. Respectively to each group, malignancy was later confirmed in 6, 20, 13, and 3 cases.

All patients underwent wire-guided excision and had the index lesions successfully removed. Of the 42 patients with confirmed malignancy, 38 required further treatment: 13 received radiotherapy alone, 13 received mastectomy alone, seven required both re-excision and radiotherapy, three required both axillary dissection and radiotherapy, one required re-excision, axillary dissection, and radiotherapy, and one refused treatment.

The rate of mastectomy for invasive breast cancer was 6/12 (50.0%) and for DCIS was 7/30 (23.3%).

Discussion

Abnormalities detected on screening mammography were graded by radiologists to represent the likeli-

Table 5. Algorithm of management of mammographic lesion

Biopsy result	Radiological grading		
	Benign	Indeterminate	Malignant
Benign	Observation	Follow-up mammography	Diagnostic wire-guided biopsy
Indeterminate	Diagnostic wire-guided biopsy	Diagnostic wire-guided biopsy	Diagnostic wire-guided biopsy
Malignant	Definitive treatment*	Definitive treatment	Definitive treatment

* Definitive treatment includes therapeutic wire-guided biopsy

hood of malignancy and to determine subsequent management. For lesions of indeterminate (equivalent to BI-RAD 4), suspicious, or malignant (equivalent to BI-RAD 5), a preoperative stereotactic biopsy was advised. For benign lesions, the choices were observation with early mammogram follow-up or stereotactic biopsy. The final decision was based on technical considerations and patients' choice.[4]

For benign or indeterminate lesions, no further action was required if the preoperative biopsy was benign. If the preoperative biopsy was malignant, definitive treatment for breast cancer was necessary. If breast conservation was feasible, therapeutic wire-guided biopsy was performed (Table 5).

Wire-guided biopsy remains an important technique in the management of mammographic abnormality. It is a surgical procedure that requires hospitalisation, but can remove the index lesion for histological analysis. For highly suspicious lesions, cost analysis[5] has revealed that wire-guided biopsy is comparable with needle localisation biopsy and stereotactic core biopsy. This is not valid for lesions that present a low or moderate index of suspicion. In addition, the need for breast-conserving surgery has to be high such that the wire-guided biopsy serves as a therapeutic procedure, because no formal operation is required when benign nature is proved.

Stereotactic core biopsy and Mammotome biopsy can provide sufficient tissue for histological diagnosis and so avoid the need for open excisional biopsy. This is particularly valuable when lesions are classified as indeterminate: the malignancy rate of such lesions varies from 2% to 50%.[6] With consideration of the medico-legal implications of a delayed diagnosis, both radiologists and surgeons would choose biopsy in preference to observation. In expert hands, core biopsy and Mammotome biopsy can provide a fairly accurate diagnosis. However, the problem of sampling error should be noted. In the author's unit, if core biopsy yields ADH, wire-guided biopsy will be performed in order to exclude DCIS.

Most patients (89.2%) underwent stereotactic biopsy prior to wire-guided biopsy. This shows integration of stereotactic core biopsy into the management protocol. The technique of stereotactic fine needle aspiration is gradually being abandoned. Although core biopsy and Mammotome are more invasive, they are also more accurate and can greatly reduce the need for re-biopsy due to insufficient sampling. In addition, experts in histological analysis are more readily available than those of cytological analysis. It should be noted that stereotactic biopsy failed to diagnose some malignancies: the likelihood of missing a carcinoma was 20% to 25%. This misdiagnosis was more likely to occur for microcalcifications and non-comedo DCIS.[7]

During the study period, a total of 17 612 screening mammograms were performed in the Well Women Clinics. The biopsy rate was approximately 3.7 per 1000 screened women. Biopsy results were benign for 1.19 per 1000 screened women. The standard set by the NHSBSP is less than 3.6 per 1000 screened women. The positive biopsy rate was 64.6%. Invasion was evident in 28.6% of the cancerous cases. The reported proportion of invasive cancer was 39.5% to 53.5%.[8-10] Thirteen (30.9%) patients in this study underwent mastectomy, a rate comparable with reported series of 36.7%.[8,9]

The rate of malignancy was higher in this study than others (22.5% to 47.9%).[8-11] This discrepancy was expected because the patients were a highly selected group (89% had prior stereotactic biopsy). There was a large proportion of DCIS cases, possibly because breast tissue was more dense in Asians. Microcalcification that was associated with DCIS was more readily diagnosed. Patients in this study were also younger (mean age, 48.7 years).

The most common mammographic abnormality in this study was microcalcification, which was more likely than density to be associated with malignancy. In other series, the most common indication for wire-guided biopsy was density.[12] Densities associated with microcalcifications had the highest predictive

value for malignancy. Nonetheless, In Franceschi et al[12] series, 81% of densities and 36% of suspicious microcalcifications were malignant. In this study, mammographic densities that could be visualised by ultrasound were likewise localised. As densities were more likely to represent invasive cancer, a large number of invasive cancers were diagnosed by ultrasound-guided biopsy/excision. Only a small number of mammographic densities needed wire-guided excision.

A comparison of the diagnoses based on radiological assessment and histological analysis demonstrates that the decision to biopsy should not be made solely on radiological grounds. When radiological grading and initial biopsy results are conflicting, wire-guided biopsy should be performed. Subsequent open biopsy has been reported necessary in 20% to 25% of patients undergoing stereotactic percutaneous biopsy where a definitive diagnosis cannot be reached.[13]

In 27 (41.5%) patients, malignancy was confirmed by stereotactic fine needle aspiration or core biopsy. Wire-guided excision was considered therapeutic in these cases, with an aim to obtain clear margins.[13,14] In the remaining patients, it was to enable histological analysis and diagnosis, regardless of margins.

Conclusion

Mammography is increasingly used as an investigation and screening tool. As such, an increasing number of abnormalities that are not associated with a palpable mass will be encountered. Although most lesions will be ultimately confirmed benign, further investigations are still necessary. Core biopsy/Mammotome is a minimally invasive procedure used for this preoperative diagnosis.

Wire-guided biopsy should be confined to therapeutic use. Nonetheless, in some difficult cases, it is still used as a diagnostic procedure. Technical difficulties are common in Chinese patients whose breasts tend to be smaller than their Caucasian counterparts. Inadequate thickness after compression poses a problem in the use of core biopsy or Mammotome because of design limitations. In these cases, placement of wire is feasible as there is less geometric limitation.

The use of minimal invasive breast biopsy techniques combined with careful case selection ensures that unnecessary use of wire-guided excisions is avoided, despite a marked increase in the utilisation of mammography. This has economic advantages for the public health care system. If more wire-guided excisions are performed, waiting time for other surgery will be longer. Audit of wire-guided excision helps monitor the effectiveness of case selection and minimise unnecessary open biopsies.

References

1. Hong Kong Cancer Registry website: http://www3.ha.org.hk/canereg. Assessed Jan 2004.
2. Schwartz GF, Goldberg BB, Rifkin MD, D'Orazio SE. Ultrasonographic localization of non-palpable breast masses. Ultrasound Med Biol 1988;14(Suppl 1):23S-25S.
3. Schwartz GF, Goldberg BB, Rifkin MD, D'Orazio SE. Ultrasonography: an alternative to x-ray-guided needle localization of nonpalpable breast masses. Surgery 1988; 104:870-3.
4. Schwartz GF, Feig SA. Nonpalpable breast lesions: biopsy methods and patient management. Obstet Gynecol Clin North Am 2002;29:137-57.
5. Fahy BN, Bold RJ, Schneider PD, Khatri V, Goodnight JE Jr. Cost-benefit analysis of biopsy methods for suspicious mammographic lesions; discussion 994-5. Arch Surg 2001; 136:990-4.
6. D'Orsi CJ, Kopans DB. Mammographic feature analysis. Semin Roentgenol 1993;28:204-30.
7. Liberman L, Dershaw DD, Glassman JR, et al. Analysis of cancers not diagnosed at stereotactic core breast biopsy. Radiology 1997;203:151-7.
8. Hastrich DJ, Dunn JM, Armstrong JS, et al. Diagnostic and therapeutic aspects of fine-wire localization biopsy for impalpable breast cancer. Br J Surg 1992;79:1038-41.
9. Silverstein MJ, Gamagami P, Rosser RJ, et al. Hooked-wire-directed breast biopsy and overpenetrated mammography. Cancer 1987;59:715-22.
10. Tresadern JC, Asbury D, Hartley G, Sellwood RA, Borg-Grech A, Watson RJ. Fine-wire localization and biopsy of non-palpable breast lesions. Br J Surg 1990;77:320-2.
11. Lee MJ, Lee JR, Thompson H, Oates GD. Mammographic identification and biopsy of occult breast cancer. Ann R Coll Surg Engl 1986;68:188-90.
12. Franceschi D, Crowe J, Zollinger R, et al. Biopsy of the breast for mammographically detected lesions. Surg Gynecol Obstet 1990;171:449-55.
13. Velanovich V, Lewis FR Jr, Nathanson SD, et al. Comparison of mammographically guided breast biopsy techniques. Ann Surg 1999;229:625-33.
14. Robidoux A. Recent trends in the management of breast cancer. 2.Occult breast lesions: when and how to perform a biopsy for mammographic abnormalities. Can J Surg 1992; 35:366-70.