ORIGINAL ARTICLE

Radial scar lesions of the breast diagnosed by needle core biopsy: analysis of cases containing occult malignancy

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Aim: To identify and review cases of false negative needle core biopsy (NCB) in the preoperative investigation of radial scar/complex sclerosing lesion (RS/CSL) lesions—that is, benign NCB from RS/CSL which contained malignancy on excision.

Methods and results: A total of 11 false negative NCB in RS/CSL lesions from 281 (3.9%) were identified (6 cases: B1, 2 cases: B2 and 3 cases: B3). In 6 of 11 cases a radial scar or stromal sclerosis was seen in NCB. Localisation biopsy showed duct carcinoma in situ in six cases, duct carcinoma in situ with invasive carcinoma in three and invasive carcinoma in two. In all 11 cases, needle tracks were identified as missing the malignant epithelium by a mean of 5 mm (median: 4 mm; range: 1–20 mm). In 9 of 11 cases, the malignancy was missed by <6 mm.

Conclusions: Despite evidence of accurate targeting of lesions, the use of NCB instead of fine needle aspiration cytology has not eliminated the problem of false negative biopsy in RS/CSL, and excision is recommended.

Radial scar lesions are small (<10 mm) and impalpable, stellate or spiculated lesions usually detected on mammography. Complex sclerosing lesions are larger (>10 mm) and may be palpable, but both lesions are regarded as part of a continuum.^{1,2} They may have a radiolucent centre, but on imaging (including ultrasound examination) cannot be distinguished from small invasive carcinomas.^{3,4} They may be difficult to sample, and diagnosis by fine needle aspiration cytology (FNAC) has had limited success and has been abandoned in some centres.⁵ The use of automated spring-loaded guns for obtaining needle core biopsies (NCB) of breast tissue has been increasingly used and has been shown in numerous studies to provide better performance parameters than FNAC.^{6–9} Although it is acknowledged that it is worthwhile sampling R4 spiculated lesions in an attempt to establish a diagnosis of malignancy (so that definitive treatment can follow), it is recognised that some radial scars contain foci of duct carcinoma in situ (DCIS) or even invasive carcinoma and in most institutions open biopsy is performed after negative biopsy. Some recent studies have documented good results in diagnosing radial scar lesions by NCB and have questioned the need for excision after a benign biopsy.^{10–12}

The aim of this study is to identify cases of radial scar/complex sclerosing lesion in which preoperative diagnosis by core biopsy failed to show occult malignancy, which was found at subsequent open diagnostic biopsy. We reviewed the benign core biopsies and undertook analysis of the open biopsies to establish the relationship between the core biopsy site and the malignancy.

MATERIALS AND METHODS

Case material

Radiologically suspicious, probably malignant (R4) lesions recorded on the screening database for the years 1989–2004 were identified. Within this group, all cases of radial scar were identified. Current guidelines were used to classify those which had been investigated by NCB.¹³ Table 1 shows how lesions were classified on radiology (R2–R5), ultrasound (US2–US5) and NCB (B1–B5).

Cases diagnosed as benign (B1, B2 or B3), but which were malignant (either in situ or invasive) on open biopsy were identified. The clinical and radiological findings, core biopsy and open biopsy material for these cases were reviewed. In total, 11 cases of radial scar lesions containing occult malignancy after a benign (B1, B2 or B3) NCB result were identified. The haematoxylin and eosin sections were retrieved from file and reviewed.

Core biopsies

In the core biopsies the presence of pauci-cellular collagen compatible with radial scar, epithelial hyperplasia, atypical epithelial hyperplasia, microcalcification and overall classification were recorded.

Open biopsies

In the excision specimens the presence of radial scar was confirmed and the architecture type, cytonuclear grade, extent (size in mm), presence or absence of necrosis and microcalcification were recorded for DCIS. For invasive malignancy the extent, grade (using the method proposed by Elston and Ellis¹⁴) and type were recorded.

Biopsy site

Evidence of the biopsy needle track was sought using the following criteria:

- Tissue disruption
- Haemorrhage
- Haemosiderin
- Haemosiderin laden macrophages
- Inflammation (neutrophil leucocytes)
- Foamy macrophages
- Fibroblastic proliferation

Abbreviations: ADH, atypical ductal hyperplasia; DCIS, duct carcinoma in situ; FNAC, fine needle aspiration cytology; NCB, needle core biopsy; RS/CSL, radial scar/complex sclerosing lesion

Table 1 Classification of lesions on radiology (R2–R5), ultrasound (US2–US5) and needle core biopsy (B1–B5)

NCB findings	Imaging
B1: unsatisfactory/normal tissue only	
B2: benign lesion present	R2/US2: benign lesion
B3: benign tissue which may be associated with malignancy nearby	R3/US3: suspicious probably benign
B4: suspicious of malignancy but too small or with too much artefact to be sure	R4/US4: suspicious probably malignant
B5a: malignant in situ disease	R5/US5: malignant lesion
B5b: malignant invasive disease	
NCB, needle core biopsy.	

An area was accepted as indicative of the needle track if four of these features were present. The distance between the needle track and the nearest malignant epithelium was measured in millimetres.

RESULTS

From the screening database, 2053 R4 lesions were identified of which 281 (13%) were recorded as radial scar. In 11 (3.9%) cases of radial scar with benign NCB diagnosis, malignancy was found on subsequent excision biopsy. In all cases, all the excision biopsy material had been examined histologically and in all (11 of 11) cases a needle biopsy track could be identified using the criteria described. Table 2 summarises the characteristics of the core biopsy and the excision biopsy.

In three cases, ultrasound was considered suspicious for malignancy and in two of these cases an invasive ductal carcinoma was found on excision. On review of the core biopsies, five were of unremarkable breast tissue and classified as B1. In six cases, there was paucicellular stromal fibrosis compatible with radial scar, three contained epithelial hyperplasia of usual type (classified as B2) and three contained epithelial hyperplasia with atypia and were diagnosed as B3. On excision, a radial scar/complex sclerosing lesion was identified in all cases ranging in size between 2 mm and 20 mm. In all, six cases had only DCIS and five cases had invasive carcinoma (size range 2–12 mm). The mean distance between NCB site and malignant epithelium was 5 (median 4, range 1–20) mm. As an example, the relationship between the radial scar, the biopsy site and the focus of malignancy is illustrated in figure 1. In one case (case 9) there was malignant calcification associated with 25 mm of comedo high-grade DCIS and the radial scar was incidental to the presence of the DCIS lesion.

DISCUSSION

Kennedy *et al*² have usefully reviewed the pathology and epidemiology of radial scar lesions. There is evidence that interpretation of FNAC material from radial scar lesions is challenging and some centres have advocated that it should not be performed when investigating R4 spiculated lesions.⁵ From the screening quality figures we have calculated a miss rate for malignancy for all R4 lesions for FNAC (21%) which is greater than that for NCB (12%). False positive results with FNAC have been reported.¹⁵ Core biopsy diagnosis of invasive carcinoma and DCIS has been shown to provide good performance parameters and false positive results are rare. False negative results do occur using NCB diagnosis documented in 9.1% of cases in a recent series.¹⁵ In 22 of 27 cases, there was a radiological or palpable mass lesion and in five cases there was radiological microcalcification. None of the false negative cases were recorded as involving a radial scar like lesion. Discordant radiological, clinical and pathological findings resulted in rebiopsy in all but five cases in which diagnosis of malignancy was delayed.¹⁶

The improved overall performance parameters obtainable using NCB suggest that this investigation might be more successful in the preoperative analysis of radial scar like lesions and allow the possibility of leaving radial scars with a benign NCB in the breast without the need for open biopsies. If an R4 spiculated lesion is investigated using NCB and a preoperative diagnosis of malignancy can be established then treatment can be planned. Difficulties arise when the core biopsy yields either normal breast tissue (B1), fibrotic tissue with benign elements with or without epithelial hyperplasia of usual type (EHUT) compatible with radial scar (B2) or fibrotic tissue with atypical hyperplasia (B3). It is well documented that a proportion of radial scar lesions whose basic architecture is of a fibrotic centre with radiating spicules containing benign epithelial elements (often with EHUT) may also contain foci of DCIS or invasive carcinoma which may be randomly distributed in the scar and may be peripheral (fig 1).^{17 18}

Three possible avenues of management have been suggested for this situation:

1. Leave the lesion in situ (avoiding an open biopsy) and follow with imaging to detect growth or change over time.
2. Sample the lesion thoroughly using multiple core biopsies in an attempt to identify any foci of malignancy or
3. Excision biopsy of the lesion.

It has been established that the presence of atypical ductal hyperplasia (ADH), atypical lobular hyperplasia or lobular carcinoma in situ in core biopsy is associated with DCIS or invasive malignancy in the excision specimen.^{19–21} This has led to the proposal to remove only those lesions in which ADH and/or LCTS are found on core biopsy.^{10–12} However, the difficulties of pathological diagnosis of ADH with high inter-observer variation is well documented making this approach less attractive.^{22 23} A study on the effect of taking multiple stereotactic guided 14-gauge core biopsies from mammographically detected stellate breast lesions showed no statistically significant improvement in sensitivity for multiple samples over one sample and in two cases malignancy was only found after six and nine core samples had been performed.²⁴

In this study, we have confirmed that DCIS and invasive malignancy may be associated with radial scar lesions. We have investigated in detail the pathology of 11 lesions in which core biopsy was benign, but which on excision contained malignancy. A total of five core biopsies were classified as B1 (normal breast tissue) and six showed fibrosis compatible with radial scar with three containing epithelial hyperplasia and two containing ADH. Multiple biopsies were not performed as the primary intention of the core was to attempt to establish a preoperative diagnosis of carcinoma, which would allow planning of treatment. All cases without a malignant diagnosis proceeded to diagnostic excision. All tissue submitted was examined histologically and in all cases the biopsy site could be identified using robust criteria. In 9 of 11 cases, the needle track missed malignant epithelium by ≤ 6 mm. Recently, three series dealing with the problem of diagnosis of radial scar on core biopsy have suggested that if the lesion is adequately sampled and there is no atypical epithelial proliferation, surgical excision may not be required.^{10–12} However, in agreement with other studies we found that the foci of malignancy were typically small and focal suggesting that even more extensive sampling might not have detected malignant epithelium. Only two cases contained atypical ductal proliferations. Increasing the number of cores does improve the chances of obtaining a representative sample, but ≥ 12 cores are required to eliminate false negative results and a vacuum assisted sampling device is required rather than spring loaded.¹⁰ A further important consideration is the difficulties of interpretation of epithelial proliferations in

Table 2 Characteristics of the core biopsy and the excision biopsy

Case	Imaging	Localisation biopsy (excision)						Distance from Bx site	Comments
		NCB	RS CSL size	DCIS	Invasive Ca	Calc	Other		
1	US4, R4	RS	10 mm	4 mm solid, intermediate	No	No	EHUT	<10 mm	Rx mastectomy residual 4 mm DCIS
2	15 mm RS	EHUT B2	15 mm	2 mm cribriform low grade	2 mm G1 ductal	Yes benign	LCIS	6 mm (DCIS)	
	4 mm RS	EHUT						3 mm (Invasive)	
3	US4, R4	B2 Normal	6 mm	No	6 mm G2 ductal	No		5 mm (LCIS)	
4	15 mm RS R4	B1 B1	5 mm	6 mm cribriform low grade	No	Yes benign and malignant	EHUT	2 mm	DCIS is not part of RS (10 mm apart)
	8 mm RS + microcalc	Microcalc						2 mm	
5	R4	RS	20 mm	16 mm cribriform intermediate grade	No	No		5 mm	
6	25 mm CSL R4	B3 Normal	14 mm	No	8 mm + sep 2 mm G1 tubular	Yes benign		20 mm	Bx 3 mm from RS
	25 mm asymmetric density microcalc	B1							2 sep cancers
7	R4 spiculated lesion	Normal	17 mm	15 mm cribriform intermediate grade	4 mm G2 ductal	Yes benign and malignant	Sclerosing adenosis, fibro cystic	4 mm (DCIS & invasive)	
8	R4, US4, Spiculate mass	B1 RS	14 mm	3 mm solid high grade	12 mm	No		4 mm	
		ADH B3			G1 ductal				
9	R4	Normal	2 mm	25 mm comedo high grade	No	Yes	Micro calc	2 mm	RS incidental and is 4 mm from DCIS
10	Microcalc R4, US3,	B1 RS	13 mm	18 mm cribriform high grade	No	Malignant Yes		4 mm	
		EHUT Microcalc B1							
11	R4 RS	RS ADH Microcalc B3	Yes	10 mm high grade	No	Yes benign		3 mm 1 mm	

ADH, atypical ductal hyperplasia; Bx, biopsy; Ca, carcinoma; CSL, complex sclerosing lesion; DCIS, ductal carcinoma in situ; EHUT, epithelial hyperplasia of usual type; G, grade; LCIS, lobular carcinoma in situ; Microcalc, microcalcification; NCB, needle core biopsy; R, radiology (mammography); RS, radial scar; US: ultrasound.

Figure 1 Low-power view of a radial scar lesion including low cytonuclear grade ductal carcinoma in situ (DCIS) towards the periphery of the scar (bottom right) and the biopsy site (top right and inset). The biopsy has missed the DCIS by 5 mm.

NCB and the problem of entrapped tubular epithelial structures within fibrotic tissue not infrequently encountered in radial scar lesions. The difficulties of categorising epithelial proliferations are well documented and may be compounded by small amounts of distorted material. Immunohistochemistry may be valuable in showing the presence or absence of myoepithelial cells around the tubular structures, but interpretation (particularly in small core samples) can be difficult as some tubular structures in benign lesions can lack myoepithelial cells.

We have shown that the use of NCB sampling has reduced but not eliminated the problem of missing malignant foci in radial scar lesions and that false negative results do occur. This study confirms previous findings that the DCIS associated with radial scars is likely to be of low or intermediate grade and that invasive carcinomas are of grade 1 or 2. As in other series, no grade 3 invasive carcinomas associated with radial scar were found.

The numbers of these problematic lesions are relatively small and we believe that to avoid the difficulties of histopathological diagnosis outlined above and to eliminate false negative results,

Take-home messages

1. The use of needle core biopsy in the preoperative diagnosis of radial scar/complex sclerosing lesions (RL/CSL) has not eliminated false negative results (3.9% in this series).
2. The mean distance between the biopsy site and malignancy was 5 mm indicative of accurate targeting of lesions.
3. This study shows that RL/CSLs should be excised for histological examination to exclude malignancy, which may be peripheral.
4. Small lesions may be suitable for excision using a mammotome.

all R4 spiculated lesions with benign (B1, B2, B3) histological findings should be excised by wire-guided localisation biopsy.

As many of these lesions are small, complete excision using a mammotome is an alternative to exclude the possibility of occult malignancy.

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