Breast Cancer Online, 2008, **11**(3), Page 1 of 4, ***e6***
doi:10.1017/S1470903108004975

ISSN 1470-9031

Focus On

Therapeutic mammotome excisions: radial scars

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Abstract Benign radial scars, lesions characterised histologically by a fibroelastic core surrounded by stellate duct proliferation, cannot be differentiated from lesions with associated invasive or non-invasive carcinoma on imaging, and histological sampling is therefore mandatory. There is also extensive evidence of the frequency with which radial scars are associated with malignancy and with other lesions that have an associated risk of malignancy. The traditionally accepted management has been the surgical excision of all suspected radial scars because insufficient tissue was removed by standard biopsy techniques to exclude associated lesions. In more recent series, it has been shown that with extensive tissue sampling of such lesions with core biopsy and modern vacuum-assisted sampling devices, the presence of associated malignancy can be excluded, thus negating the need for surgical excision.

Keywords: Cancer; Lesions; Radial scars; Mammotome

Introduction

Radial scars or complex sclerosing lesions have been shown to have an incidence of around 0.6/1000–0.9/1000 in screening populations [1,2]. Prior to the introduction of screening, mammographically apparent radial scars were rarely seen and experience was largely of incidental radial scars found in pathological specimens. The management of mammographically detected radial scars remains under debate. Difficulty with differentiation of benign radial scars from those with associated malignancy, both radiologically and pathologically, has caused contradiction within the literature.

Radial scar is a lesion characterised histologically by a fibroelastic core surrounded by stellate duct proliferation [3].

The early postulation that radial scars are a precursor for tubular carcinoma [4] has been largely superseded with the use of newer immunohistological techniques. Several series have looked at other histological lesions associated with radial scars. Alvarado *et al*. [5] reviewed 17 selected cases with associated malignancy; 8 showed lobular neoplasia involving the peripheral ductals in a patchy fashion, ductal carcinoma in situ (DCIS) was seen in 3 lesions and 6 lesions were involved by invasive carcinoma, predominantly ductal. The select nature of this group from a busy practice was emphasised, with the majority of radial scars being benign with no evidence to suggest radial scar as a precursor to malignancy.

A review of 47 mammographically detected radial scars showed a 10% association with DCIS, 1% with antidiuretic hormone (ADH) and 1% invasive carcinoma [6]. Mokbel *et al*. [7] reviewed 32 radial scars, 6 of which had invasive carcinoma and four DCIS arising within the radial scar; 2 cases were associated with atypical epithelial hyperplasia and 17 were associated with regular epithelial hyperplasia. Sloane and Mayers [8] and Burnett *et al*. [1] give rates of 20% and 22%, respectively, for atypical hyperplasia without evidence of carcinoma. Cawson *et al*. [9], in a review of 75 mammographically detected

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Received: 18/03/08
Accepted: 20/03/08
BCO/497/2005/FO

radial scars, reported no invasive cancers, 5 (7%) radial scars associated with DCIS and 42 (57%) radial scars had associated atypical ductal hyperplasia. The large variation in reported rates of lesions associated with radial scars is suggested to be in some part due to the inconsistency in pathology reporting with overdiagnosis of invasive malignancy due to entrapped ducts seen within the radial scars [5] and also variation in reporting of atypical hyperplasia and regular hyperplasia.

Jacobs *et al*. [10] reported radial scars as an independent risk for breast cancer, leading to a doubling of the risk in a cohort of largely incidental radial scars seen in benign breast biopsies, subsequently followed for a mean time of 12 years. In contrast, a more recent study showed that the increased risk of invasive carcinoma could be largely attributed to the associated proliferative hyperplasia rather than the to the presence of a radial scar and found no significant difference in breast carcinoma risk if the proliferative hyperplasia was outside vs. associated with the radial scar [11].

Wellings *et al*. [12] found that the number of radial scars in extensively sampled breasts was greater in women with breast carcinoma than those without breast carcinoma. In contrast, a study by Anderson *et al*. [13] concluded that the extent of tissue sampling was the likely determinant in radial scar detection rather than any association with malignancy. Subsequently, in a study of 83 consecutive, unselected female autopsies, Nielsen *et al*. [14] found no difference in the frequency of radial scar between women with breast carcinoma and women with either normal breasts or benign breast disease. They also found that the frequency of radial scars was significantly increased among women with fibrocystic disease (43%) compared with women without such changes (17%). A second autopsy study by Nielsen *et al*. [15] of women with breast carcinoma found radial scars to be a common lesion in the contralateral breast of women with breast carcinoma, but the incidence of contralateral malignancy was not significantly increased in these breasts. Sloane *et al*. [16] reported a clear relationship between the size of radial scars and the presence of carcinoma or atypical hyperplasia and also noted that associated lesions were more likely to be seen at the periphery, which is of importance with regard to biopsy of these lesions.

Mammographic and ultrasound features of radial scars

The characteristic mammographic appearance of radial scar is a localised distortion with multiple long, thin spiculations, which may become more numerous and clumped together at the centre of the lesion. There is typically no dense, central tumour mass of a size corresponding to the length of the spicules. Instead there may be translucent, oval or circular areas at the centre of the radiating structure. Radiolucent linear structures are also seen to intersperse the radio-opaque spicules. Radial scars classically show differing conspicuity in different projections, and despite distinct mammographic findings, there is usually no palpable lesion [2]. Although most radial scars show all or some of these characteristics, small invasive carcinomas also show these mammographic features. Ciatto *et al*. [17] reviewed 83 stellate lesions and concluded that the typical features of radial scar were not specific to radial scars and were also seen within a minority of small cancers.

Radial scars are frequently not visible on ultrasound. Abnormal ultrasound findings are a hypoechoic area associated with acoustic shadowing and distortion, and are indistinguishable from the features of invasive cancer [18]. Finlay *et al*. [19] found 'no ultrasound appearances sufficiently specific to radial scars to allow confident exclusion of malignancy'.

Biopsy of radial scars

Due to the difficulty in differentiation between radial scar and small invasive cancers on imaging and the frequent association of radial scars with other lesions, histological sampling of all stellate lesions is mandatory. The type and extent of histological sampling is again a source of debate in the literature.

FNAC has been shown to be unreliable in sampling of radial scars [20,21].

The management of radial scars has been variable. Recent studies have shown that extensive sampling with multiple core biopsies is accurate in excluding malignancy. Cawson *et al*. [9] reported a series of 75 screen-detected radial scars. Of these patients, 63 underwent multiple 14-G core biopsy and 62 went on to have surgical excision. Fifty-five underwent stereotactic needle core biopsy (SNCB) and 8 patients underwent ultrasound guided needle core biopsy (UNCB). None of the lesions were associated with invasive malignancy. Non-invasive malignancy was diagnosed in 5 cases, 4 of which had undergone SNCB, in 1 case DCIS was diagnosed at core biopsy, the remaining 3 showed ADH at core biopsy. The fifth case of DCIS was diagnosed at surgical biopsy following positive cytology on FNAC. In this study, 42/74 (57%) cases were associated with ADH on surgical histology. Of these 42 excised radial scars, 29 were sampled by SNCB, with ADH identified at core biopsy in

https://doi.org/10.1017/S1470903108004975 Published online by Cambridge University Press

21 (72%). The overall sensitivity for the detection of benign radial scars by SNCB was 85% and 63% for UGCB. The correlation between the number of core biopsies taken and sensitivity was also examined; those women that had five or more core biopsies were more likely to have a correct core biopsy diagnosis; however, this was not statistically significant.

Kirwan *et al*. [22] examined 72 women with stellate lesions, of which 34 lesions were radial scars, 5 fibrocystic disease and 1 ADH. Twenty-three (32%) had malignant surgical outcome, of which 16 (22%) were invasive. Core biopsy showed a 94% sensitivity for the detection of invasive malignancy with only one discordant result showing ADH on core biopsy. Of the 7 cases of non-invasive malignancy diagnosed at surgical excision, 4 had discordant results with core biopsy. ADH was reported on core biopsy in 2 cases, both of which were found to be DCIS on surgical excision. Atypical lobular hyperplasia was reported at core biopsy on the other 2 cases, one of these was DCIS on surgical excision and the second lobular carcinoma *in situ*. This study showed improved sensitivity with six or more cores. A complete sensitivity for the diagnosis of malignancy in women with mammographically detected stellate lesions of 100% was demonstrated.

Brenner *et al*. [23], in their series of radial scars, demonstrated that no carcinomas were missed when sampling with more than 12 specimens or when sampling with a vacuum-assisted device was performed. Becker *et al*. [24] reviewed 227 cases of radial scars and also demonstrated that no cancers were missed when sampled with 11-G vacuum-assisted biopsy (VAB) as opposed to 14-G core biopsy. They concluded that if benign radial scar is found on 14-G CB, further evaluation is needed with 11-G VAB or surgery. Data from these papers show that diagnostic surgical excision of suspected radial scar is not necessary if extensive sampling using vacuum biopsy shows histological features of a benign radial scar with no atypia.

Series assessing the accuracy of 11-G VAB compared with 14-G spring-loaded devices show significant reduction in rebiopsy rates [25] and a false-negative rate of 0.6% with an experience of 15 or more procedures by an individual operator [26]. Liberman *et al*. [27] concluded that complete excision rather than sampling of the mammographic target with an 11-G vacuum-assisted device yielded no significant differences in the frequency of sparing surgery, atypical ductal hyperplasia underestimates, rebiopsy or complications in a series of solitary lesions, although complete excision did lead to fewer discordant results with fewer underestimates of DCIS.

Conclusion

It is clear that benign radial scars cannot be differentiated from lesions with associated invasive or non-invasive carcinoma on imaging, and histological sampling is therefore mandatory. There is also extensive evidence of the frequency with which radial scars are associated with malignancy and with other lesions that have an associated risk of malignancy. The traditionally accepted management has been the surgical excision of all suspected radial scars because insufficient tissue was removed by standard biopsy techniques to exclude associated lesions. In more recent series it has been shown that with extensive tissue sampling of such lesions with core biopsy and modern vacuum-assisted sampling devices, the presence of associated malignancy can be excluded, thus negating the need for surgical excision.

In our institution, the current practice for assessment of a suspected radial scar is 14-G core biopsy under ultrasound guidance if the lesion is ultrasonographically visible or 11-G vacuum-assisted stereotactic core biopsy with at least 12 cores taken. Following 14-G core biopsy, if the histology is consistent with radial scar we will go on to sample with 11-G vacuum-assisted core biopsy (VACB) usually under stereotactic guidance taking at least 12 cores. All such cases undergoing assessment and sampling are discussed at the multidisciplinary meeting to decide on management. If, following extensive sampling with 11-G VACB, the histological findings are of a benign radial scar with no evidence of atypia, then the lesion can be left. If there is evidence of atypia, diagnostic surgical excision is advised.

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