Variations in Physician Recommendations for Surgery After Diagnosis of a High-Risk Lesion on Breast Core Needle Biopsy

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OBJECTIVE. This article focuses on four high-risk lesions: lobular neoplasia, benign papilloma, radial scar, and flat epithelial atypia. Controversies exist in the management after core biopsy of each of these lesions—whether to perform immediate surgical excision so as not to miss an associated malignancy or imaging follow-up because concomitant malignancy is low. This review is staged in two parts per lesion. The first is from data gathered during the last two American Roentgen Ray Society annual meetings from the audience response system querying practice management styles per diagnostic lesion. The second part is a brief review of selected articles recommending either follow-up or surgery. The strengths and weaknesses of each article are discussed.

CONCLUSION. Our opinion is that neither recommendation, surgical excision or follow-up, is well substantiated in the literature and that our ignorance is not serving the needs of women worldwide. The time is now for a prospective trial.
we must ask, “What are we doing and why?” The objective of this article is to present the results from the polls and to make radiologists aware of the limitations in the literature on which clinical decisions are being based.

Methods
For each pathologic diagnosis, we evaluated individual physicians in practice methods via an audience response survey at the 2010 and 2011 annual meetings of the ARRS. In 2010, we used a real-time audience response system during the course to get immediate responses to the proposed clinical scenarios. In 2011, the same clinical scenarios were sent to conference participants in advance of the course. We received exemption from our institutional review board because the data collected from 14 institutions with 32,000 core biopsies (0.9%) surgical pathology results were collected in 164 (59%) of 278 patients [10], with 278 cases of lobular neoplasia collected from 14 institutions with 32,000 core biopsies (0.9%). Surgical pathology results were reviewed in 164 (59%) of 278 patients who underwent surgical follow-up. Because of a 23% upgrade rate to malignancy (25%, 17/67 LCIS; 22%, 21/97 ALH), these authors recommended surgical follow-up for all cases of lobular neoplasia. However, there are limitations to the study. Selection criteria for surgery were unknown and not uniform across institutions; there was no follow-up for cases that did not go to surgery (41%); and although radiology-pathology concordance was conducted in some cases, the definitions were variable across institutions or unknown. Moreover, follow-up of patients not selected for surgery was nonexistent. These shortcomings pervade throughout the literature for all four high-risk lesions, not just lobular neoplasia. Additionally, because the prevalence of each of these lesions on core biopsy is low, retrospective studies were needed to gather enough cases to analyze, but none had results of statistical significance. Fluctuations in percentiles of upgrades are marked because of such small numbers. Selected studies advocating either surgical excision or imaging follow-up will be discussed.

One of the largest to date is by Brem et al. [10], with 278 cases of lobular neoplasia collected from 14 institutions with 32,000 core biopsies (0.9%). Surgical pathology results were reviewed in 164 (59%) of 278 patients who underwent surgical follow-up. Because of a 23% upgrade rate to malignancy (25%, 17/67 LCIS; 22%, 21/97 ALH), these authors recommended surgical follow-up for all cases of lobular neoplasia. However, there are limitations to the study. Selection criteria for surgery were unknown and not uniform across institutions; there was no follow-up for cases that did not go to surgery (41%); and although radiology-pathology concordance was conducted in some cases, the definitions were variable across institutions or unknown.

In contrast, the study by Hwang et al. [11] suggested that only imaging and clinical follow-up were warranted because of a < 2% upgrade rate. This study reviewed the surgical pathology follow-up in 136 cases (41%)
from 333 core biopsies of lobular neoplasia. Of these, 87 cases were only lobular neoplasia as the highest risk lesion, with malignancy at surgical biopsy in one (2%) of 48 cases of ALH and nine (23%) of 39 cases of LCIS. On further review of the malignancies associated with LCIS, six of nine were radiology-pathology discordant and the remaining three were cases of nonclassic or pleomorphic variants of LCIS in which treatment with surgical excision is advocated as in ductal carcinoma in situ (DCIS) [12]. If those nine cases are excluded because surgical management is warranted in these scenarios, there was only one case in 87 (1%) of lobular neoplasia at core biopsy that had concomitant malignancy. Therefore, those authors suggest that only imaging and clinical follow-up are indicated after lobular neoplasia (classic form) at core biopsy. However, the major limitation of this study is that there was no follow-up in the majority (~60%) of the core biopsies of lobular neoplasia.

Recent studies have focused on the contribution of MRI to help triage which lesions at core biopsy need surgical follow-up. The study by Strigel et al. [13] retrospectively reviewed the pathology results after MRI identified lesions as high-risk. Of the total number studied (n = 61), which included cases of ADH, ALH, LCIS, and radial scar, there were only two cases of ALH and two of LCIS at core biopsy that underwent subsequent surgical excision. Malignancy was found in only one (50%) of the two cases of ALH, and no malignancy was found in the LCIS or radial scar cases. Yet the case of the upgraded ALH was one in which MRI was performed for a known cancer to evaluate the extent of disease. Thus, the probability of finding additional malignancy at surgery is more likely related to the existing cancer rather than the ALH. Moreover, it is considered the standard of care to excise ADH found on core biopsy. Therefore, after removing these cases of ADH from the final analyses, there was only one upgrade in a patient with ALH, but that was in a patient with a known cancer. Yet the authors recommended surgical excision for all high-risk lesions. In summary, the lobular neoplasia literature is not robust enough to justify either surgical or imaging-clinical follow-up.

**Pathology concerns:** lobular neoplasia—“Lobular neoplasia” is a term that encompasses ALH and LCIS. The cells of both ALH and LCIS are similar in appearance: The cells are small, uniform, discohesive, and generally lack nucleoli. The degree of the involvement of the lobular units distinguishes these two entities. Although there is disagreement in the literature as to specific criteria to distinguish LCIS from ALH, a widely accepted definition by Page et al. [14] requires for LCIS that at least 50% of the acinar units in a lobule be “filled and distended” by lobular neoplastic cells. The definition of distention was further quantified to require the presence of at least eight lobular neoplastic cells spanning an individual acinar unit [15]. If a lobular unit does not fulfill these criteria, a diagnosis of ALH is made. Most pathologists recommend maintaining the two entities as separate, given that follow-up studies show a lower rate in the incidence of the subsequent development of invasive carcinoma for ALH compared with LCIS [16–18]. Unfortunately, much of the core biopsy literature sums these results into “lobular neoplasia.” The reader should be vigilant when comparing studies as to whether results are presented as lobular neoplasia or if they distinguish LCIS from ALH.

Recently, variants of LCIS have been described that do not fit this classic LCIS histopathology, including LCIS with central necrosis and pleomorphic LCIS [5, 19–22]. Because of the small numbers of cases and lack of significant follow-up data, the natural history of these variants is not well established, but early data suggest that LCIS variants such as these may have a more aggressive behavior. Thus, many clinicians are recommending surgical biopsy when one of the variants of LCIS is present on core biopsy.

**Benign Papillomas**

Case 2: A 42-year-old asymptomatic woman presented with a 1-cm retroareolar mass on a screening mammogram. On ultrasound, the mass was hypoechoic and circumscribed. An ultrasound core biopsy was performed using a 14-gauge biopsy needle and five cores were obtained. The pathology results were intraductal papilloma without atypical hyperplasia or carcinoma; surrounding tissues showed proliferative fibrocystic changes.

What is your recommendation?

A. The case is radiology-pathology concordant and benign; imaging follow-up.

B. The case is radiology-pathology discordant and benign; but because of the presence of papilloma, surgical excision is recommended.

These results (Table 3) show that, as with lobular neoplasia, there is the trend to recommend surgical excision over follow-up, although a greater percentage of respondents advocate follow-up for benign papilloma than for lobular neoplasia.

**Literature review:** benign papilloma—A well-investigated study was reported by Liberman et al. [23] in 2006 that advocated surgical follow-up after core biopsy of benign papillomas. From approximately 3800 cores, 50 (1.3%) were benign papillomas; of these, 25 underwent surgical follow-up and 10 underwent imaging follow-up for at least 2 years. The rate of malignancy was 14% (5/35); the malignant cases were four DCIS and one infiltrating ductal carcinoma. Many studies stop their analysis at this point, whereas Liberman et al. reviewed the five cases of malignancy and noted that three cases showed growth of a mass or a new mass at follow-up, one case developed bloody nipple discharge, and one case was self-selected for surgical excision. On further review of this latter case, the DCIS was 1-cm distal to the benign papilloma. Hence, the malignancy at surgical follow-up was incidental and unassociated with the papilloma. Therefore, for all of the patients who were asymptomatic and without suspicious imaging findings at follow-up, the upgrade rate was 0%.

An opposing recommendation of only imaging follow-up was made in the large study by Bennett et al. [24]. The authors studied 120 benign core biopsies with either surgery (n = 45) or greater than 2-year follow-up (n = 75). No malignancies were detected.

The study by Skandarajah et al. [25] that recommended surgical follow-up, appears at first glance to be stronger than most of the literature because the cases were collected prospectively. All 80 benign papillomas underwent immediate surgical excision without selection bias and the malignancy rate was 19% (15/80). However, the authors subsequently reviewed the relationship of the papilloma to the malignancy at pathology, and noted that “the ma-

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**Note**—Data in parentheses are percentages.

**TABLE 3: Registrant Responses for Benign Papilloma**

<table>
<thead>
<tr>
<th>Response</th>
<th>2010 (81)</th>
<th>2011 (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concordant; imaging follow-up</td>
<td>34 (42)</td>
<td>10 (29)</td>
</tr>
<tr>
<td>Concordant but because of papilloma; recommend surgery</td>
<td>47 (58)</td>
<td>24 (71)</td>
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majority of cancers were next to the papilloma.” Unfortunately, further details of this radiology-pathology evaluation were not provided. Similar analysis was conducted by Bernik et al. [26], whose study showed a 9% (4/47) malignancy rate. However, the authors defined “the surrounding tissues” as “within 3 cm of the indexed papillary lesion,” which in some women may be in a separate quadrant and unrelated to the papilloma. These three studies illustrate the need to perform radiology-pathology concordance analyses to understand whether coexistent malignancies are associated with or are incidental to the high-risk lesion.

Two studies with statistical significance that may be helpful in selecting cases for surgery made the observation of the relationship of size of the papilloma to malignancy. Chang et al. [27] noted that the mean size of malignant papillomas was 1.4 cm and of benign papillomas was 0.9 cm (p = 0.039). Similarly, Kil et al. [28] noted in 76 cases that the cancer-atypical papillomas were most commonly greater than 1.5 cm and located peripherally in the breast as opposed to centrally (p = 0.017).

Pathology issues: benign papilloma—The criteria used for distinguishing ADH versus DCIS arising in a papilloma are not well defined in the pathology literature. For example, some pathologists consider any amount of low-grade DCIS in a papilloma sufficient for a diagnosis, whereas others use a minimum size criteria or a percentage of the papilloma that is involved by DCIS. If the amount of DCIS is below this size measurement or percentage, a diagnosis of ADH is made [29, 30]. Although this might not affect a decision for surgical excision from a core diagnosis because all ADH or DCIS on a core are excised, these variations in definitions will significantly affect the upgrade rate on surgical follow-up. ADH in a papilloma would not be counted as an upgrade, whereas if a second pathologist called the finding DCIS, it would be counted as an upgrade.

Radial Scar

Case 3: A 42-year-old woman underwent baseline mammography that showed architectural distortion (no prior surgical history); ultrasound-guided core biopsy was performed with a 14-gauge biopsy needle and five cores were obtained. The pathology results were radial scar with the following comment: “A smooth muscle myosin heavy-chain immunostain was performed to confirm that the irregular glands in this lesion were entrapped benign glands and not invasive (tubular) carcinoma.” What is your recommendation?

A. The case is radiology-pathology concordant; imaging follow-up.
B. The case is radiology-pathology concordant, but due to presence of radial scar, surgical excision is recommended.
C. The case is radiology-pathology discordant because radial scar is incidental without imaging correlate; recommend surgical excision.

The respondents clearly favored surgical excision over follow-up, although the trend for more follow-up in 2011 was insignificant compared with 2010 (Table 4).

Literature review: radial scar—Surgical follow-up after benign radial scars was advocated by Becker et al. [31] in a large study that analyzed 227 (1.5%) of approximately 15,000 cores that “included a radial scar at pathology.” Follow-up by surgery or at least a 24-month clinical-imaging follow-up occurred in 184 (81%) of 227 cases. Data were analyzed by needle type and gauge. There were 100 benign radial scars biopsied with a 14-gauge biopsy needle (average number of cores was six) and 25 benign radial scars biopsied with an 11-gauge vacuum-assisted probe (average number of cores was 32). In the 14-gauge biopsy needle (n = 100) cohort, there were four cancers (8%) in 50 cases that underwent immediate surgical excision and one malignancy (2%) in 50 cases that underwent imaging follow-up. In the 11-gauge vacuum-assisted group, there were no cancers in either the immediate surgical group (n = 9) or follow-up group (n = 16), suggesting that a larger amount of tissue clearing from the lesion and surrounding tissues may obviate surgical follow-up, notwithstanding that 32 is an unusually large number of core samples, greater than in most practices. The overall malignancy rate with benign radial scars was 4% (5/125). The strength of this study was that only 20% of the benign radial scars had no documented follow-up, but a limitation to the study was the lack of radiology-pathology concordance. Additionally, the image presentation and level of suspicion are not known.

In contrast to the study by Becker et al. [31] is the equally large study by Douglas-Jones et al. [32] that suggests only imaging follow-up. There were 11 (4%) cancers at surgical follow-up in 281 core biopsies of radial scars. At pathology, the authors reviewed the core tracks and nine of 11 cores missed the targeted lesion by an average of 5 mm (range, 1–20 mm). Unfortunately, the authors did not specify either needle gauge and type (core biopsy vs vacuum-assisted) or mode of imaging guidance. In summary, the adjusted malignancy underestimation rate was 0.7% (2/281).

Pathology issues: radial scar—“Radial scar” and “complex sclerosing lesion” are terms used to describe a characteristic pathologic stellate lesion seen at low power containing a central elastic stromal area often containing entrapped benign ducts. At the periphery, ducts and glands radiate away from the central area. These ducts can contain usual-type hyperplasia, atypical hyperplasia, and even in situ carcinoma. By convention, “radial scar” refers to a lesion measuring ≤ 1 cm, and “complex sclerosing lesion” refers to the same histology but for lesions > 1 cm [33]. The inability of pathologists to distinguish radial scar from tubular carcinoma has been exaggerated in the literature. Although the appearance of radial scar can mimic invasive carcinoma both pathologically and on breast imaging, the entrapped glands within the central elastotic area of radial scars are benign and maintain their basal myoepithelial cell layer. Tubular carcinomas lose that cell layer and are thus invasive. Moreover, immunohistochemical stains, even on core biopsy, can be used to corroborate H and E interpretations. Therefore, if the centers of the lesions have been core biopsied, the argument that pathologists cannot distinguish tubular cancer from radial scar is incorrect and should not dictate surgery.

Flat Epithelial Atypia

Case 4: A 48-year-old woman presented with a new cluster of punctate calcifications and underwent a stereotactic core biopsy.

<table>
<thead>
<tr>
<th>TABLE 4: Registrament Responses for Radial Scar</th>
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<tbody>
<tr>
<td>Response</td>
</tr>
<tr>
<td>Consonant; imaging follow-up</td>
</tr>
<tr>
<td>Consonant but because of radial scar; recommend surgery</td>
</tr>
<tr>
<td>Discordant because radial scar is incidental without imaging correlate; recommend surgery</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.
sy with an 11-gauge vacuum-assisted needle. An adequate sample of calcifications was obtained with 12 cores. The pathology results were proliferative changes, including columnar cell change with focal nuclear atypia; there was no carcinoma. Calcifications were noted within flat epithelial atypia and surrounding ducts and lobules.

What is your recommendation?
A. The case is radiology-pathology concordant; imaging follow-up.
B. The case is radiology-pathology concordant, but due to the presence of flat epithelial atypia, surgical excision is recommended.

The results (Table 5) are consistent between 2010 and 2011, with the recommendation for surgical excision more frequently recommended than imaging follow-up after flat epithelial atypia on core biopsy.

**Literature review: flat epithelial atypia—**
A study by David et al. [34] supported surgical excision. The study consisted of 40 cases of flat epithelial atypia (25 columnar cell hyperplasia with atypia and 15 columnar cell changes with atypia) at core biopsy with surgical follow-up. There were seven carcinomas (17.5%) that were all in the columnar cell hyperplasia with atypia cohort, especially lesions 10 mm or greater in size.

Martel et al. [35], on the other hand, recommended imaging follow-up. They followed 63 cases of flat epithelial atypia for an average of 6 years (range, 1–11 years), and nine cancers developed (14%). Of these, seven were ipsilateral in location (mean, 3.7 years), hence not present at the time of flat epithelial atypia, and two were contralateral (mean, 7 years), hence unrelated. Moreover, two of seven ipsilateral malignant cases had undergone an interval core biopsy after flat epithelial atypia showing ADH. There were five patients with ipsilateral surgical excision after flat epithelial atypia at core biopsy, and no malignancies were found. Therefore, the authors suggested that flat epithelial atypia is a risk marker for the development of malignancy but is not evidence of underestimation of a concurrent malignancy. Therefore, close follow-up and not immediate excision was suggested.

The largest study to date with surgical follow-up after flat epithelial atypia on core biopsy is the recent article by Lavoue et al. [36] of 60 cases (1.5%) of “pure” flat epithelial atypia in a cohort selected from 4062 core biopsies. The pathology definition of flat epithelial atypia according to the World Health Organization [37] was meticulously applied, and the radiologic findings were reviewed for radiology-pathology correlation. Eight of the 60 (13%) cases were upgraded to DCIS or invasive carcinoma at surgical follow-up. There were no clinical or radiographic features that predicted the cases that were upgraded. Therefore, these authors suggest surgical excision for all cases of flat epithelial atypia but acknowledge that a larger prospective trial is warranted.

**Pathology issues: flat epithelial atypia—**
The term “flat epithelial atypia” was adopted by the World Health Organization Working Group on the Pathology and Genetics of Tumors of the Breast in 2003 [37] to define a lesion of the terminal-ductal lobular unit that was recognized more than 100 years ago. Flat epithelial atypia has been variably described as “clinging carcinoma,” “atypical cystic lobules,” and “columnar alteration with prominent apical snouts and secretions with atypia” among others. In flat epithelial atypia, the often cystically dilated ducts are lined by one to several layers of monomorphic but enlarged round to oval cells with low-grade cytologic atypia. Although the cells are atypical, there are no architectural changes as seen in ADH or DCIS, such as micropapillary or cribriform growth patterns. As part of the spectrum of columnar cell changes, there may be “flocculent secretions in the lumina of the acini,” and these may calcify [38]. Numerous studies have shown an association between flat epithelial atypia and low grade DCIS, lobular neoplasia, and tubular carcinoma [39–46]. Several recent articles cover the natural history of this lesion and its clinical significance [47–49].

The literature on flat epithelial atypia is confounded by a lack of agreement in pathology on the definitions of atypia within columnar cell change. Darvishian et al. [50] studied pathologist interobserver variability in the categories of atypia. Fifty-one cases of atypia, specifically ADH, ALH, and flat epithelial atypia, were anonymized and distributed to four specialized breast pathologists for independent review. After this review, the pathologists gathered for a tutorial session to review the general criteria of atypia on a second set of known cases. The study cases were then rereviewed as a group to come to a consensus diagnosis for each of the 51 cases. The independent reviews were used to determine the interobserver agreement using kappa statistics. The consensus diagnosis was used to determine the diagnosis for upgrade after surgical excision. Overall, this group achieved a “substantially” high agreement with an overall kappa value of 0.79 (95% CI, 0.69–0.89), and 0.85 for flat epithelial atypia. Two other studies corroborated the finding that interobserver agreement in cases of columnar cell change improved with training [51, 52].

**Conclusion**
Current rates of underestimation of malignancy with the high-risk lesions,lobular neoplasia, benign papilloma, radial scar, and flat epithelial atypia, are inaccurate because most are derived from retrospective studies with the following limitations:
1. Because of the low incidence of these lesions, the number of patients is small in most studies and, consequently, does not achieve statistical significance.
2. Most data are selected from review of surgical pathology files. Therefore, the selection of patients for surgery is unknown, and the follow-up of patients not excised is often poor or nonexistent.

**TABLE 6: Summary of Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Respondent Answers (83)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will not change</td>
<td>35 (42)</td>
</tr>
<tr>
<td>Definitely change</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Will consider changing</td>
<td>16 (19)</td>
</tr>
<tr>
<td>Now completely confused</td>
<td>28 (34)</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.
3. Most studies lack radiology-pathology concordance in which the type of radiologic finding warranting biopsy and level of suspicion is not reported and the proximity of the malignancy at immediate surgery after core to the core tracks to determine if related vs incidental is often not studied.

The Recommendation for Surgical Follow-Up: Who Is Responsible? The Roles of the Radiologist and Pathologist

The practice guidelines for ultrasound-guided breast interventional procedures of the American College of Radiology [53] clearly indicate that the radiologist performing the core biopsy is responsible for determining the radiology-pathology concordance and communicating those results to the physician or patient. The practice guidelines for stereotactic core biopsy have similar recommendations [54].

Although we think that more direct communication between breast pathologists and radiologists is clearly needed, unfortunately there is no direct relationship between the two in many hospitals and breast centers. Thus, recommendations could be made in a “void” by pathologists who may not have seen the radiographic images. Even in cases where the pathologists do have access to the radiographic images, we believe that pathologists would be overstepping their professional boundary by attempting to determine whether there is radiographic concordance or not. Pathologists should not be interpreting radiographic images, just as radiologists should not be interpreting pathology slides. We think this could hinder appropriate treatment of the patient by “forcing the hand” of the radiologist to recommend surgery and of the surgeon to perform an open biopsy when the pathology results could be concordant on the basis of the radiologist’s interpretation of the imaging findings. Thus it is essential for both disciplines to work in conjunction to make these important decisions, particularly when follow-up surgery is open for discussion.

Audience Wrap-Up Question

The following (Table 6) was the final question posed in the 2010 course:
Case scenario 5: “Now that you have been updated in the literature, your management of high-risk lesions on core biopsy will...”

These answers reflect the state of current medical practice—confusion. For those who were anticipating answers as to what to do, we have none to share. Whether women undergo immediate surgical excision or follow-up is random. Prospective trials to achieve statistical significance are badly needed. Ideally, treatment options should be developed for specific patient populations on the basis of personal risk of cancer development.

References

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APPENDIX 1: Lobular Neoplasia (Case 1A)

The same scenario and questions were presented as in case 1 but with the change made only in the pathology results for atypical lobular hyperplasia (ALH).

Respondent Results for ALH

<table>
<thead>
<tr>
<th>Result</th>
<th>2010 (85)</th>
<th>2011 (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concordant; imaging follow-up</td>
<td>21 (25)</td>
<td>8 (23)</td>
</tr>
<tr>
<td>Concordant but because of ALH; recommend surgery</td>
<td>56 (66)</td>
<td>23 (68)</td>
</tr>
<tr>
<td>Discordant because ALH is incidental without imaging correlate; recommend surgery</td>
<td>8 (9)</td>
<td>3 (9)</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.
APPENDIX 2: Lobular Carcinoma In Situ (LCIS) (Case 1B)
The same scenario and questions were presented as in case 1 but with a change made in the pathology results for pleomorphic LCIS.

Respondent Results for Pleomorphic LCIS

<table>
<thead>
<tr>
<th>Result</th>
<th>2010 (85)</th>
<th>2011 (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concordant; imaging follow-up</td>
<td>7 (8)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Concordant but because of LCIS; recommend surgery</td>
<td>55 (65)</td>
<td>29 (85)</td>
</tr>
<tr>
<td>Discordant because LCIS is incidental without imaging correlate; recommend surgery</td>
<td>23 (27)</td>
<td>4 (12)</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.

APPENDIX 3: Benign Papilloma (Case 2A)
The same scenario and questions were presented as in case 2, but the core biopsy was obtained with an 11-gauge vacuum-assisted needle and 12 cores were obtained. The pathology results were intraductal papilloma without atypical hyperplasia or carcinoma; surrounding tissues showed proliferative fibrocystic changes.

Respondent Results for Benign Papilloma

<table>
<thead>
<tr>
<th>Result</th>
<th>2010 (80)</th>
<th>2011 (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concordant; imaging follow-up</td>
<td>50 (63)</td>
<td>13 (38)</td>
</tr>
<tr>
<td>Concordant but because of papilloma; recommend surgery</td>
<td>30 (37)</td>
<td>21 (62)</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.

APPENDIX 4: Radial Scar (Case 3A)
The same scenario and questions were presented as in case 3 with architectural distortion on a baseline mammogram, now cored using an 11-gauge vacuum-assisted probe to obtain 12 cores; pathology results are as noted in case 3—radial scar.

Respondent Results for Radial Scar

<table>
<thead>
<tr>
<th>Result</th>
<th>2010 (79)</th>
<th>2011 (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concordant; imaging follow-up</td>
<td>18 (23)</td>
<td>16 (47)</td>
</tr>
<tr>
<td>Concordant but because of radial scar; recommend surgery</td>
<td>61 (77)</td>
<td>18 (53)</td>
</tr>
</tbody>
</table>

Note—Data in parentheses are percentages.