A Prospective Study about Abnormal Ductal Dilatations without Associated Masses on Breast US:

What is the Significance for us?

Sung Eun Song, MD, Ann Yie, MD, Bo Kyoung Seo, MD, PhD, Seung Hwa Lee, MD, PhD, Kyu Ran Cho, MD, PhD, Ok Hee Woo, MD, PhD, Ki Yeol Lee, MD, PhD, Young Sik Kim, MD, PhD

Rationale and Objectives: Ductal changes are described as a finding of surrounding tissues in breast masses according to the Breast Imaging Reporting and Data System – Ultrasound. However, ductal changes are often found as an isolated finding without a mass on ultrasound. The purpose of this study was to investigate the clinical significance of abnormal ductal dilatations without masses on breast ultrasound.

Materials and Methods: From August 2006 to August 2008, 75 pathologically verified pure ductal dilatations without associated masses on breast ultrasound were collected. Ultrasound findings including the diameter and length of the duct, the presence of ductal wall thickening and intraluminal content, the echo pattern of intraluminal content, and distribution were evaluated. The ultrasound findings were correlated with clinical and pathologic features, and radiologic differences between benign and malignant lesions were assessed using Fisher's exact tests.

Results: Of the 75 cases with abnormal ductal dilatations, seven (9%) were malignant, and four (5%) were atypical ductal hyperplasia. Ductal dilatations were longer in malignancies than in benign lesions ($P < .05$). Ductal wall thickening was more frequent in malignancies (100%) and atypical ductal hyperplasia (50%) than in other benign lesions (3%) ($P < .05$). Hypoechoic intraluminal content was more common in malignancies (86%) and atypical ductal hyperplasia (50%) than in other benign lesions (8%) ($P < .05$). Furthermore, a segmental distribution was more frequent in malignancies (43%) than in benign lesions (1%). Clinical symptoms were also frequent in malignancies (86%) than in benign lesions (4%) ($P < .05$).

Conclusions: Abnormal ductal dilatations without masses have a 9% malignancy rate, and these would be recommended to undergo biopsy as suspicious abnormalities according to Breast Imaging Reporting and Data System – Ultrasound. Ultrasound has an essential role in the assessment of abnormal ducts for distinguishing benign and malignant ductal changes.

Key Words: Breast; breast ducts; breast ultrasound; dilated mammary duct; breast carcinoma.

In the first edition of the Breast Imaging Reporting and Data System (BI-RADS) – Ultrasound, ductal changes are defined as abnormal caliber and/or arborization and belong to findings of surrounding tissues for breast masses (1). The significance and clinical management of ultrasound-detected ductal dilatations and the positive predictive value for malignancies or high-risk lesions have been less commonly reported in the past (2,3). Also, BI-RADS – Ultrasound does not provide detailed explanations about how to assess abnormal ducts, and it does not provide recommended clinical guidelines. The clinical significance of abnormal ductal dilatations on mammography or magnetic resonance imaging is known, and ductal dilatations have a wide spectrum of pathologic diagnoses, from benign lesions including fibrocystic changes, intraductal papilloma, or ductal hyperplasia to carcinomas (4,5). Recently, Hsu et al (6) performed a retrospective study of dilated ducts on breast ultrasound and demonstrated that the positive predictive value for malignancy ranged from 9% to 43% according to the presence of associated masses, multiplicity, or intraductal content.

Pure ductal dilatations without associated masses of the breast are frequently found on breast ultrasound examinations, because ultrasound has been widely used as a screening modality or an adjuvant tool following mammography (7). Physicians often hesitate to decide on the possibility of malignancy when they encounter pure ductal dilatations on breast

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From the Department of Radiology (S.E.S., B.K.S., S.H.L., K.Y.L.) and the Department of Pathology (Y.S.K.), Korea University Ansan Hospital, Gojan 1-dong, Danwon-gu, Ansan-si, Gyeonggi-do 425-707, Korea; the Department of Radiology, Seoul National University Hospital, Seoul, Korea (A.Y.); the Department of Radiology, Korea University Anam Hospital, Seoul, Korea (K.R.C.); and the Department of Radiology, Korea University Guro Hospital, Seoul, Korea (O.H.W.). Received June 9, 2011; accepted October 13, 2011. **Address correspondence to:** B.K.S. e-mail: seoboky@korea.ac.kr

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ultrasound because of the lack of previous studies and experience.

The purpose of this study was to analyze the ultrasound features of abnormal ductal dilatations without associated masses, correlate pathologic findings, and investigate the clinical significance of abnormal ductal dilatations on breast ultrasound.

MATERIALS AND METHODS

Study Population

From August 2006 to August 2008, 4540 consecutive women underwent breast ultrasound in our hospital for the identification and characterization of abnormalities noted on clinical breast examinations and/or mammography, screening in high-risk women and women with dense breast tissue, and evaluation of problems with implants. We prospectively collected patients who had ductal dilatations without associated masses on breast ultrasound. We excluded patients who had diffuse dilated ducts related to pregnancy, lactating state, or hyperprolactinemia. We initially enrolled 86 patients who had pure ductal dilatations and then excluded 14 patients who had recent breast surgery, core biopsy, or fine-needle aspiration within the previous 6 months, as well as those with no pathologic tissue confirmation. A total of 75 abnormal ducts in 72 patients who had pure ductal dilatations on breast ultrasound and pathologic verification were enrolled in this study. Pathologic diagnoses were obtained by core-needle biopsy (n = 46), vacuum-assisted biopsy (n = 10), or excisional biopsy (n = 19). If a lesion was verified as a malignancy on biopsy, surgical treatment was performed. All patients were women, ranging in age from 26 to 66 years (mean, 41.3 years). Ultrasound examinations were performed using an iU22 system (Philips Medical Systems, Bothell, WA). We used a high-frequency, broad-bandwidth linear-array transducer at 12 to 5 MHz. The effective aperture length of the transducer was 50 mm. All breast lesions were evaluated with conventional, compound, and tissue harmonic techniques. Imaging was performed by one breast radiologist with 10 years of experience in breast ultrasound. The radiologist also had knowledge of clinical and mammographic features. If a case of focal ductal dilatation was detected, it was evaluated in the transverse, longitudinal, radial, and antiradial planes. All ultrasound images were automatically transferred to a picture archiving and communication system, and the radiologists then evaluated the soft-copy images. This study was approved by our institutional review board.

Image Analysis

Two breast radiologists (with 4 and 10 years of experience in breast imaging) evaluated ultrasound images for 75 abnormal ducts by consensus. We measured maximum diameters and lengths of the dilated ducts and assessed the presence of ductal wall thickening and intraluminal content. Normal mammary ducts have clear borders between the anechoic lumen and surrounding breast tissues, in addition to imperceptible walls. If a ductal wall has pathologic changes, it can be thickened and result in indistinct borders between the ductal lumen and surrounding breast tissue. If a dilated duct had obvious wall thickening and/or indistinct borders compared with surrounding tissue, we considered there to be ductal wall thickening. If an intraductal nodule or filling materials were present within the dilated duct, we determined that the dilated duct had intraluminal content. In cases with intraluminal content, we evaluated the echo pattern of the intraluminal content and classified patterns as hypoechoic, isoechoic, hyperechoic, or calcifications compared with surrounding subcutaneous fatty tissue. The distribution of ductal dilatations was classified as focal or segmental. In addition, we reviewed the medical records and evaluated the clinical symptoms, such as palpable lumps, nipple discharge, or pain.

We also evaluated mammograms. Mammographic images were available for 60 lesions from 59 patients. Fifteen ductal lesions from 13 patients were not evaluated on mammography. Ten patients did not undergo mammography: four young women aged < 35 years who underwent follow-up entire breast ultrasound following ultrasound-guided core-needle biopsy or fine-needle aspiration biopsy in the contralateral breast lesions, three asymptomatic young women with implants, one young woman with breast pain, and two women who refused mammography. The remaining three patients underwent mammography at a local clinic but did not provide the images to our hospital. Craniocaudal and mediolateral oblique mammograms were obtained using a digital mammographic unit (Selenia; Hologic Cooperation, Denver, CO). If routine mammograms were not complete for evaluation, we obtained additional spot compression or magnification views. Mammographic findings were classified as masses, calcifications, or asymmetric densities according to the BI-RADS – Mammography lexicon (8).

Pathologic Examinations

All specimens were formalin fixed, paraffin embedded, and then examined by hematoxylin and eosin staining by a board-certified pathologist. The pathologic diagnoses were classified as benign or malignant lesions. If a lesion was malignant, it was classified as invasive carcinoma or ductal carcinoma in situ (DCIS) (9,10). Benign breast lesions were classified according to the criteria set by Dupont and Page (11), which include proliferative lesions with atypia, proliferative lesions without atypia, and nonproliferative lesions. Proliferative lesions with atypia included atypical ducal hyperplasia or atypical lobular hyperplasia. Biopsied tissues were classified as containing proliferative disease without atypia if they did not meet the criteria for atypical hyperplasia but contained moderate or florid epithelial hyperplasia, papillomas, sclerosing adenosis, or other similar lesions. Nonproliferative lesions included cysts, fibrosis, nonsclerosing adenosis, mild epithelial hyperplasia, inflammation, or apocrine metaplasia.