Ultrasound-Guided Versus Wire-Guided Breast-Conserving Surgery for Nonpalpable Breast Cancer

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Abstract

We investigated the efficacy of ultrasound (US)-guided breast conserving-surgery (BCS) in 158 women with nonpalpable breast cancer. We found that intraoperative US is effective and accurate noninvasive method for tumor localization and excision during BCS and should be preferred in the cases of nonpalpable breast cancers.

Purpose: To determine the efficacy of ultrasound (US)-guided excision of nonpalpable breast cancer and compare it to standard wire-guided breast-conserving surgery (BCS). **Methods:** One hundred fifty-eight women with nonpalpable breast cancer who underwent BCS were retrospectively studied. Positive surgical margins and reexcision rates were investigated. **Results:** Of the total cohort, 68 patients were treated with wire-guided and 90 with US-guided tumor excision. The tumor and patient characteristics were similar in the 2 groups; 13.2% and 12.2% of patients in the wire-guided and US-guided groups, respectively, had positive margins. Patient age, menopausal status, tumor size, histologic type, and histologic grade were associated with increased risk of positive margins. The shave margins were reexcised at the time of original operation more often by wire-guided localization (26.5%) than in the US-guided group (10.0%) ($P = .010$). The surgeon was able to identify correctly the problematic margin in 100% via intraoperative US and in only 27.8% when the wire-guided surgery was used ($P < .001$). The reexcision rate by a second operation was similar in 2 groups ($P = .798$). Eight (11.8%) of 68 patients in the wire-guided group and 9 (10.0%) of 90 patients in the US-guided underwent a second operation. **Conclusion:** US-guided BCS is as effective and safe as standard wire-guided excision of nonpalpable breast tumors.

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Introduction

During the last 2 decades, breast-conserving surgery (BCS) followed by adjuvant radiation has become the standard treatment for early breast cancer[1] and is as effective and safe as mastectomy. The incidence of inadequate (positive or close) resection margins has been described to range between 5% and 60%.[2] Although the influence of surgical margin status on local recurrence is well documented, the impact of positive surgical margins on overall survival remains an issue under debate.[3] Patients undergo reexcision to reduce the incidence of ipsilateral recurrent disease and to obtain clear pathologic margins.

To obtain adequate surgical margins, different localization methods have been used: palpation-guided, wire-guided, and radioguided excision.[4] Ultrasound (US) has been successfully used for imaging-guided breast biopsy and diagnostic procedures.[5,6] However, the use of intraoperative US in BCS was used for the first time in the late 1980s as an alternative method to detect nonpalpable breast tumors.[7] Since then, several groups have tested the feasibility and security of the method, but most series included a small number of patients, and the benefits of US-guided BCS have been controversially discussed.[8,9] One third of newly diagnosed breast cancers are nonpalpable, and the standard surgical method remains wire-guided surgery. Moreover, with the increasing use of neoadjuvant treatment, the rate of nonpalpable breast cancer will increase, making this topic all the more important.

Our goal was to compare the rate of positive resection margins and reexcisions between standard wire-guided BCS and US-guided surgery in a large cohort of breast cancer patients with nonpalpable tumors.

Patients and Methods

Patients

The records of patients with breast cancer diagnosed at our institution between 2006 and 2012 were retrospectively reviewed.

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We included all consecutive patients who underwent BCS for nonpalpable breast cancer. Exclusion criteria were ductal carcinoma-in-situ only, palpable tumors, mastectomy, and no surgery.

During the evaluated period, 158 patients fulfilled the study criteria. The study design is shown in Figure 1. Four hundred fifty-five patients were excluded. US-guided tumor excision was undertaken in 90 patients. The other 68 patients were treated with standard wire-guided BCS. Written informed consent was obtained from all patients before treatment. This study was approved by the Research and Ethical Committee of the Otto-von-Guericke University, Magdeburg, Germany, and specific informed consent for this retrospective analysis was deemed unnecessary.

Surgical Treatment

The patients were grouped on the basis of the localization method used into wire- and US-guided excision groups. In the wire-guided group, the completeness of tumor removal was evaluated by specimen radiography. Additional intraoperative resection of tissue of the excision cavity was undertaken in the case of suspect close surgical margins in specimen radiography. In the US group, intraoperative US scanning was performed using the portable Micro Maxx US system (Sono Site, Bothell, WA, USA) as previously described.[2,10] The US was performed in the transverse and craniocaudal direction, and the excision borders were marked by sterile skin marker. After specimen removal, an ex vivo US was performed by the surgeon to determine the accuracy of the complete tumor resection. The margins in all orientations were measured. In the case of suspect close surgical margins, the reexcision of shave margins from the excision cavity was performed intraoperatively. In 2 groups, a segmental resection to the pectoralis fascia was used.

In cases of positive or close surgical margins for the primary surgical specimens diagnosed by the pathologist, a repeat excision in a second operation was undertaken. The total excision volume was calculated by the pathologist and included the volume of the primary surgical excision specimen and the intraoperatively reexcised tissue in a case of intraoperative reexcision.

Statistical Analysis

Statistical calculations were performed by SPSS 22.0 (IBM, Armonk, NY, USA). The Fisher exact test or χ^2 tests were used to compare the different pathologic variables between 2 groups. Analysis of variance was used to compare the medians of nonparametric variables. The results were considered statistically significant at $P < .05$.

Results

Patient and Tumor Characteristics

Table 1 lists the patient and tumor characteristics. The study population comprised 158 patients with breast cancer divided in 2 groups. Group 1 consisted of 68 patients (43.0%) treated with wire-guided BCS with a median age of 62 years (range, 26-79 years). In group 2, 90 patients (67.0%) underwent a US-guided tumor

Figure 1 Study Design