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Excising the Reexcision: Stereotactic Core-Needle Biopsy Decreases Need for Reexcision of Breast Cancer

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Abstract. There is debate regarding use of the stereotactic core-needle biopsy (SCNB) for highly suspicious mammographic lesions. This study compares a serial group of mammography-detected breast cancer patients treated before and after the use of SCNB. We studied 113 consecutive nonpalpable breast cancers between 1994 and 1996. Altogether 47 patients were diagnosed by wire-localized breast biopsy (wire group) and the next 66 consecutive breast cancer patients by SCNB (stereo group). Negative margins were found more often in the stereo group than in the wire group (77% vs. 38%, $p < 0.001$). Reexcision was required more frequently in the wire group than in the stereo group (68% vs. 21%, $p < 0.001$), and one-staged surgical procedures were done more often in the stereo group than the wire group (79% vs. 21%, $p < 0.001$). The volume of the initial wide excision was much larger in the stereo group than in the wire group ($p = 0.002$). Those in the wire group required 50% more operations per patient (1.8 vs. 1.2) than the stereo group. A significant cost savings can be estimated in the stereo group compared with the wire group. The use of SCNB was associated with breast excisions of larger volume, negative margins, and decreased need for reexcision. Simultaneous adjunct procedures resulted in one-stage operations, improving cost savings. The use of SCNB for nonpalpable breast cancer benefits the patient, the surgeon, and the payor. It should be undertaken prior to the first surgical procedure.

Screening mammography can detect nonpalpable breast cancer and can reduce mortality by 30% [1, 2]. Stereotactic core-needle biopsy (SCNB) has become the standard for the diagnosis of mammographic lesions with low to intermediate risk of malignancy. The benefits include patient convenience, the ability to provide a diagnosis without open surgery, and overall cost savings [3–7]. There is controversy regarding the value of SCNB of mammographically suspicious or highly suspicious lesions. Some say SCNB adds an extra procedure and so is not a benefit to the patient or cost-effective [8–10]. Others hold that the diagnosis of breast cancer before the first operative procedure allows preoperative planning, yielding fewer reexcisions and more procedures completed in one stage [11]. To study this question, we reviewed our experience before and after the use of SCNB.

Patients and Methods

We retrospectively reviewed 113 consecutive mammography-detected nonpalpable breast cancer patients at our institution between 1994 and 1996 before and after the use of SCNB. All patients had either in situ or invasive breast carcinoma as the final diagnosis. There were 47 consecutive patients diagnosed with breast cancer by wire-localized breast biopsy before the use of SCNB (wire group). These patients were compared to the next 66 consecutive breast cancer patients who were diagnosed with SCNB (stereo group).

The same group of surgeons, radiologists, and pathologists performed all procedures. Margins were inked and classified as positive or negative. The margins were negative when there was at least 1 mm of normal tissue beyond the inked margin. Focal microscopic involvement of margins was considered a positive margin. Indications for reexcision were not standardized among the surgeons. Some patients who had focal microscopic involvement of margins did not have reexcision when irradiation was considered adequate treatment by the attending physician.

The evaluation protocol for the two groups after suspicious mammography is shown in Figure 1. Patient characteristics were similar in the two groups, including patient age, frequency of mammographic calcifications, tumor size and histology, treatment methods, and incidence of positive nodes (Table 1). We compared the measurements of the greatest maximal length and total volume of the breast specimen from the first surgical procedure. Specimen volume was calculated from pathology reports by multiplying the measured height, width, and length of single specimens. Volumes for multiple pieces of the first surgical specimen were added.

Differences were tested for significance by the chi-square and t-tests using SPSS software, version 6.1.2 for Windows (SPSS, Chicago, IL, USA).

We compared the average cost per patient using cost estimates for the number of procedures in each group. We used all inclusive estimates of charges for the variety of procedures performed in these patients. These figures include the surgeons' fees, hospital or outpatient charges, and the pathology, radiology, pharmacy, and laboratory charges. Figures used in this calculation were, for

Abnormal Mammogram Protocol

Wire Group ← → **Stereo Group**

Wire Group

1 **Wire Localized Biopsy**
  ↓
2 **Mastectomy**
  Re-excise + Nodes
  Axillary Dissection
  Re-excision
  ↓
3 **Mastectomy**

Stereo Group

Stereo Core Biopsy
  ↓
1 **Lumpectomy**
  Lump + Nodes
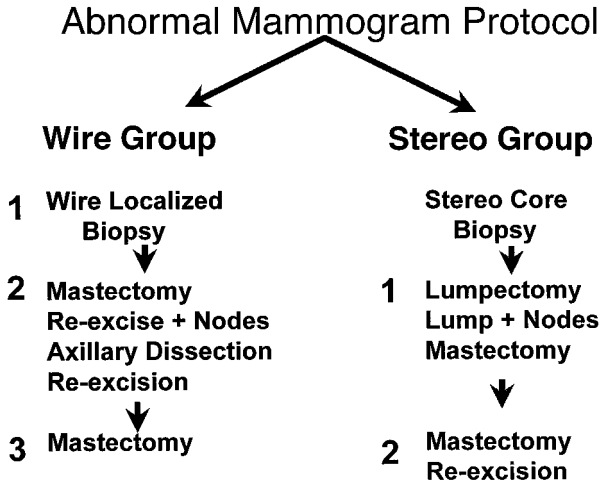 **Mastectomy**
  ↓
2 **Mastectomy**
  Re-excision

Fig. 1. Abnormal mammogram protocol. Numbers refer to surgical procedures.

Table 1. Characteristics of 113 nonpalpable mammographically detected breast cancer patients, 1994–1996.

Characteristic	Wire ($n = 47$)	Stereo ($n = 66$)
Age (years)	62	64
Invasive CA (%)	57	61
DCIS (%)	43	39
Tumor size (mm)	16	15
Calcifications (%)	48	42
Masses (%)	52	58
Total nodes (no.)	10	10
Positive nodes (%)	15	14
Lumpectomy/XRT (%)	62	71
Mastectomy (%)	38	29

CA: carcinoma; DCIS: ductal carcinoma in situ; XRT: radiation therapy.
All $p > 0.05$.

SCNB $1000, lumpectomy $2500, lumpectomy with axillary dissection $6000, axillary dissection $4000, and mastectomy $8000.

Results

After the first surgical procedure, negative margins were achieved twice as often in the stereo group as in the wire group (77% vs. 38%, $p < 0.001$) (Fig. 2). Reexcision was required in the wire group three times more frequently than in the stereo group (68% vs. 21%, $p < 0.001$) (Fig. 3). Use of a one-stage surgical procedure was found much more frequently in the stereo group than in the wire group (79% vs. 21%, $p < 0.001$) (Fig. 4).

The specimen from the first surgical procedure was reviewed. The maximal length of the surgical specimen was not different in the stereo and wire groups (6.8 cm vs. 5.2 cm, $p = 0.19$), but the biopsy volume of the surgical specimen was larger in the stereo group than in the wire group (97.3 cc vs. 37.3 cc, $p < 0.002$) (Fig. 5). The presence of calcifications on the original mammogram was associated with a higher incidence of reexcision and mastectomy in the entire series. There was no difference in the frequency of calcifications in the two groups.

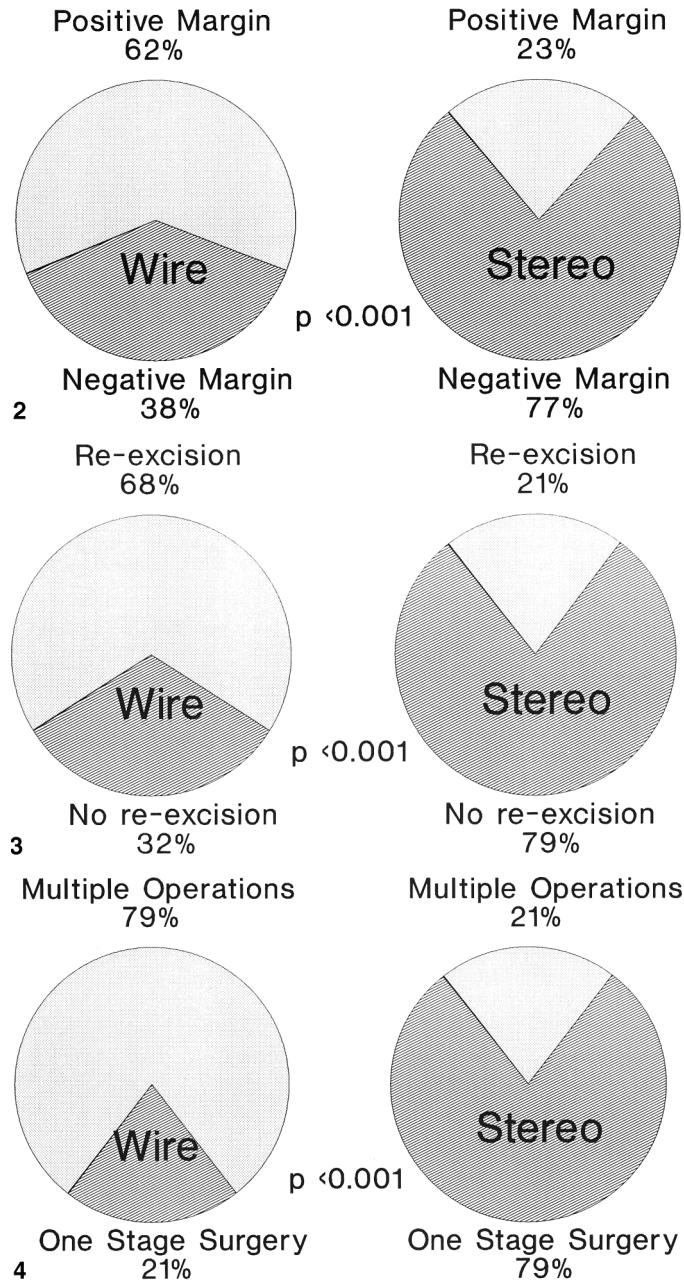We estimated the average cost per patient using the frequency

2 Positive Margin 62% / Negative Margin 38% (Wire); Positive Margin 23% / Negative Margin 77% (Stereo); $p < 0.001$

3 Re-excision 68% / No re-excision 32% (Wire); Re-excision 21% / No re-excision 79% (Stereo); $p < 0.001$

4 Multiple Operations 79% / One Stage Surgery 21% (Wire); Multiple Operations 21% / One Stage Surgery 79% (Stereo); $p < 0.001$

Fig. 2. Negative margins of first surgical breast specimens in the wire and stereo groups: 113 patients during 1994–1996.

Fig. 3. Percentage of patients requiring reexcision of the breast after the first breast surgery in the wire and stereo groups: 113 patients during 1994–1996.

Fig. 4. Percentage of patients in each group needing only one surgical procedure for their cancer treatment: 113 patients during 1994–1996.

of procedures performed in either group. Figure 6 shows the percentage of patients in each group who required additional procedures. On average, there were 2.2 procedures (both operations and SCNB) per breast cancer patient in the stereo group and 1.8 in the wire group. The number of operations performed per breast cancer patient in the wire group was 50% higher on average than the number in the stereo group (1.8 vs. 1.2 opera-
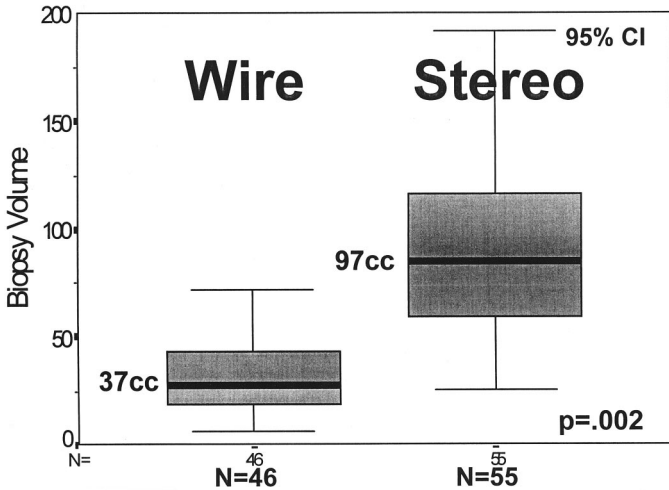
Fig. 5. Volume of the first surgical breast biopsy specimen, according to pathology reports. Volume was measured by multiplying the height, width, and depth of the first specimen removed: 113 patients during 1994–1996. There were 11 immediate mastectomies performed in the stereo group.
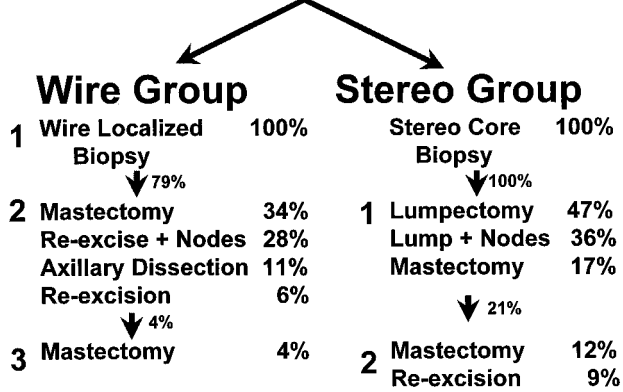

Fig. 6. Percentage of patients in each group who required additional surgical procedures. Percentages are of the whole group (abnormal mammogram protocol), either wire or stereo.

tions). Using the estimated figures for charges, the average cost per patient diagnosed in the wire group ($7810) was 12% higher than that in the stereo group ($6870). The break-even point when charges for the stereo group would be equal to charges of the wire group occurs if the cost for SCNB is $1900 (instead of $1000).

Discussion

Stereotactic core needle biopsy has been widely accepted to treat the patient with a mammographically detected abnormality of low suspicion. The benefits include improved patient comfort and decreased total cost of diagnosis [3–7]. However, there is controversy when one considers it for the patient with a suspicious mammogram. Some say that SCNB is an additional step in the process and thus not cost-effective, as surgery is ultimately necessary [8–10]. Others say that SCNB decreases the need for reexcision, allows one-stage surgery, and is thus more convenient and cost-effective for the patient [11].

We had the opportunity to study this question in our community. There is only one hospital, one outpatient surgical facility, and one group of physicians providing care to our county, which is located some distance away from a major medical facility. The arrival of the SCNB procedure offered an opportunity to study those patients with mammography-detected breast cancer just before and just after initiating use of SCNB.

Although a prospective study would be desirable, breast cancer patients form only a subgroup of all the patients with an abnormal mammogram and they are not identified until after histologic examination. Because 58% to 85% of abnormal-mammogram patients do not have cancer, SCNB has been accepted as the better method for evaluating those patients, rather than wire-localized biopsy [3, 4]. Thus it was not acceptable to alternate prospectively all the abnormal mammogram patients between the SCNB and wire groups when most of the patients would have benign disease. The next best alternative was to compare the subset of breast cancer patients managed by the same group of radiologists and surgeons immediately before and after the availability of SCNB.

Care providers and management skills were unchanged; the only variable was the SCNB technology. The major difference was the ability to diagnose breast cancer on nonpalpable but mammographically detectable lesions before the first surgical procedure. This early diagnosis allowed a complete discussion regarding the need for wide excision and the addition of adjunctive procedures, such as axillary dissection. Those patients who chose mastectomy could make that choice before the first surgical procedure. Surgeons, knowing the diagnosis preoperatively, then attempted to achieve clear surgical margins and were not concerned that a cosmetic defect would occur in someone with a benign process.

The value of SCNB versus wire-localized breast biopsy has been questioned for patients with nonpalpable breast cancer. Because all patients with cancer require a surgical procedure, the "additional" step of SCNB is redundant [3, 9, 12–15]. However, even with high quality mammography, magnified views, and ultrasonography, the positive predictive value of wire-localized breast biopsy varies up to 46% [16].

Wire-localized breast biopsy is acceptable when it achieves negative margins. Previous investigators have shown the rate of positive margins to vary from 45% to 76% after wire-localized breast biopsy [17–20]. If negative margins are not achieved, reexcision results in further surgical time and expense with a less than ideal cosmetic result. Even when negative margins are obtained, a return trip to the operating room may be necessary for the axillary dissection. Repeated operations increase both patient discomfort and total cost.

When the diagnosis is known, the goal of surgery changes from identifying the cause of the mammographic abnormality to that of securing negative margins. In the stereo group, 77% of patients had negative margins, and 79% had no reexcision. One patient had no reexcision for a margin less than 1 mm (focally positive). In the wire group, 38% had negative margins and 32% had no reexcision. Two patients had reexcision despite negative margins. In these cases, the surgeon was going back to the operating room for axillary dissection and wished to improve the width of the clear margin. Negative margins occurred in the stereo group twice as often as in the wire group (Fig. 2). This led to the wire group

undergoing reexcision three times as often as the stereo group (Fig. 3). These results are similar to those of other investigators [21].

The reason margins were negative is shown by the data on the volume of the first surgical specimen. The volume of the breast specimen removed after SCNB was 2.6 times larger than that removed at wire-localized breast biopsy (Fig. 5). Because the longest dimension of the surgical specimen was not significantly larger in either group, it follows that the stereo group had thicker specimens.

In both groups together (113 patients), the presence of calcifications increased the likelihood of reexcision and eventual mastectomy, consistent with the findings of others [22]. When calcifications were present, there was a 56% incidence of reexcision (28/50). When no calcifications were present, only 29% had reexcision. Similarly, when calcifications were present, mastectomy was necessary (after the first surgical procedure) in 35% of patients. Without calcifications on the original mammogram, patients required mastectomy only 17% of the time. This did not explain the differences in the two study groups, as calcifications were present to the same degree in both groups. There were also no differences in the two groups regarding patient age, mammographic characteristics, tumor size or histology, axillary positive nodes, or treatment modality.

When the diagnosis is known preoperatively, the surgeon can obtain consent for any necessary adjunctive procedures, such as axillary dissection, sentinel node biopsy, or mastectomy [23]. Combining informed consent with wider specimen excision resulted in most patients having single-stage surgery. One-stage surgery was accomplished four times as often in the stereo group as in the wire group (Fig. 4). This benefits the patient by allowing complete preoperative discussion and fewer trips to the operating room. The surgeons can spend the time to obtain surgical consent for the adjunctive procedures that are necessary. Fewer reexcisions should improve cosmesis.

The cost-effective value of SCNB in benign disease is well documented [24–26]. In this group of breast cancer patients, a single trip to the operating room occurred four times more often in the stereo group than in the wire group. It was due to both the ability to achieve negative margins at the first surgical procedure and the addition of adjunct surgical procedures. When the diagnosis is known preoperatively, the time it takes for consenting patients to undergo axillary dissection or other adjunctive procedures is most efficiently utilized in the stereo group. In the stereo group, 17% (11/66) of patients chose to have mastectomy as their first and only surgical procedure.

The average number of procedures (SCNB plus operations) was greater in the stereo group than in the wire group (2.2 vs. 1.8). However, SCNB provides the diagnosis before the first surgical procedure, which allows surgery to be completed more efficiently. There was an average of 1.2 operations performed on the stereo group compared to an average of 1.8 operations performed on the wire group per cancer diagnosis (Fig. 7). This 50% increase in the number of operative procedures needed without SCNB directly leads to increased costs in the wire group.

We estimated the average cost per patient, using the frequency of procedures necessary in each of our patients (Fig. 6). Using the estimated charges for those procedures, the average cost is 12% higher in the wire group ($7810) than in the stereo group ($6870). This is directly related to the increased number of
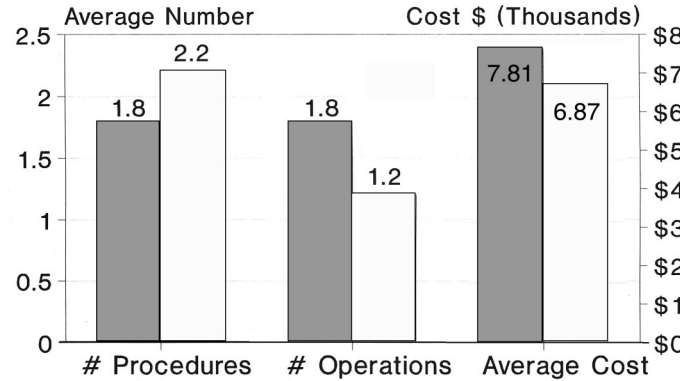

Fig. 7. Differences in the wire (shaded bars) and stereo (open bars) groups (113 patients during 1994–1996) in regard to the average number of procedures per breast cancer patient, average number of operations per breast cancer patient, and average cost per breast cancer patient.

Table 2. Benefits of stereo core breast biopsy for cancer for patients, surgeons, and insurers.

Patient's benefits
Complete preoperative discussion
Definitive surgical choice more clear
Fewer trips to operating room
Surgeon's benefits
Allows proper surgical consent
Requires fewer surgical procedures and time
Avoids reexcisions, improves cosmesis
Insurer's benefit
More predictable costs, less expense

operations performed in the wire group (Fig. 7). The "additional" procedure of SCNB in cancer patients is outweighed by the decrease in the number of operations needed for therapy. This degree of cost savings is similar to that found by other investigators [17, 23–26]. Using the figures for estimated charges, SCNB would have to almost double in cost (from $1000 to $1900) before the average cost is equal in both groups. These data are important considering the impact of risk-bearing contracts for patient care in current health plans.

Benefits to patients, surgeons, and insurers of SCNB are summarized in Table 2. The use of SCNB decreases the need for reexcision of breast cancer compared to wire-localized breast biopsy. Histologic proof of the diagnosis prior to the first surgical procedure allows the surgeon to achieve negative margins twice as often as with wire-localized biopsy. When SCNB is used to diagnose breast cancer, a single surgical procedure is possible four times as often as with wire localization. Before the use of SCNB, 50% more operations were needed for patients undergoing breast cancer treatment. A cost savings of 12% is estimated for breast cancer patients who have SCNB. SCNB is suggested in patients with mammography-detected breast cancer before the first surgical procedure due to improved patient convenience and cost savings.

Résumé

Introduction: La valeur diagnostique de la biopsie par aiguille stéréotactique (stereotactic Core Needle Biopsy (SCNB)) pour des lésions hautement suspectes en mammographie n'est toujours

pas bien définie. Dans cette étude on a comparé un groupe de patientes ayant un cancer du sein détecté avant et après la disponibilité de la SCNB. Patientes et méthodes: On a analysé les dossiers de 113 patientes consécutives ayant un cancer du sein, non palpable, vues entre 1994 et 1996. Le cancer a été diagnostiqué par biopsie avec repérage par fils (groupe W) chez 47 patientes et par la SCNB chez les 66 patientes consécutives suivantes (groupe S). Résultats: Les marges de sécurité étaient négatives plus souvent dans le groupe «S» que dans le groupe «W» (77% vs. 38%, p < 0.001). Une deuxième excision a été nécessaire plus souvent dans le groupe «W» par rapport au groupe «S» (68% vs. 21%, p < 0.001). On a effectué plus de procédés en un seul temps dans le groupe «S» que dans le groupe «W» (79% vs. 21%, p < 0.001). Le volume de l'excision initiale était beaucoup plus important dans le groupe «S» comparé au groupe «W» (p = 0.002). On a eu besoin de pratiquer 50% plus d'interventions par patiente (1.8 vs. 1.2) dans le groupe «W» par rapport au groupe «S». Les bénéfices du point de vue économique ont été plus importants dans le groupe «S» par rapport au groupe «W». Conclusions: Avec l'utilisation de la SCNB, on réalise des excisions du sein plus larges, on obtient des marges de sécurité négatives et on a moins besoin de pratiquer des ré-interventions. La réalisation de la chirurgie en un temps entraîne des économies. L'utilisation de la SCNB pour les cancers du sein, non palpables, présente des avantages pour la patiente, le chirurgien et les contribuables. Il faut l'employer dès qu'on envisage le diagnostic.

Resumen

Introducción: Existe debate sobre el uso de la Biopsia Estereotáctica con Aguja (BEA) en lesiones que en mamografía aparecen altamente sospechosas de malignidad. En el presente estudio se hizo la comparación en una serie de pacientes con cáncer de seno detectado por mamografía y tratados antes y después del uso de la BEA. Pacientes y métodos: Entre 1994 y 1996 estudiamos 113 pacientes consecutivas con cáncer mamario no palpable; cuarenta y siete fueron diagnosticadas por biopsia con localización mediante alambre metálico (Grupo localización). Las siguientes pacientes consecutivas fueron diagnosticadas por BEA (Grupo Estéreo). Resultados: Márgenes negativos fueron hallados con mayor frecuencia en el Grupo Estéreo (77% vs. 38%, p < 0.001), y la re-resección resultó más frecuente en el Grupo Localización (68% vs. 21%, p < 0.001). La resección en una sola etapa ocurrió con mayor frecuencia en el Grupo Localización (79% vs 21%, p < 0.001), como fue mayor el volumen resecado (p = 0.002). Las pacientes del Grupo Localización requirieron 50% más operaciones por paciente (1.8 vs. 1.2). Se estima que hubo un ahorro significativo de costos en el Grupo Estéreo. Conclusiones: El uso de BEA apareció correlacionado con resecciones mamarias de mayor volumen, márgenes negativos y menor necesidad de re-resección. Procedimientos adjuntos simultáneos fueron practicados en una sola etapa, con el consiguiente ahorro de costos. El uso de BEA en cáncer no palpable beneficia al paciente, al cirujano y al pagador, y debe ser realizada con anterioridad al primer procedimiento quirúrgico.

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Invited Commentary

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Kaufman and his colleagues present a comparison of stereotactic core-needle biopsy (SCNB) and wire-localization biopsy. Although I am in favor of SCNB for the diagnosis of suspicious mammographic abnormalities, I do not think the comparison presented here is completely fair. The initial wire-localization procedures were diagnostic. With the high rate of benign biopsies (on average 80% of mammographic abnormalities), surgeons have learned to be conservative regarding the size and extent of diagnostic procedures. This is substantiated in this study by the fact that the size of the specimens from the operations done for diagnosis (initial wire localization) is much smaller than the size during operations done as treatment (wire localization following SCNB). In fact, the total number of procedures was higher in the SCNB group than in the wire localization group.

The real message of this study is that SCNB diagnosis allows a planned definitive excision and therefore saves most women an operation. In addition, it allows the surgeon the opportunity to sit down and discuss the options for local control with the patient before any surgery is performed.

There are other potential benefits of SCNB for diagnosis of lesions. The surgeon contemplating a mastectomy does not have to contend with an ill-placed diagnostic biopsy scar and can consider skin-sparing surgery. In certain cases it allows confirmation of pathology and biomarkers prior to neoadjuvant chemotherapy. The local response of the tumor to systemic treatment can then be measured in real time, and potential down-staging can increase the possibility for breast conservation.

Our ability to obtain reliable pathologic and biologic information on tumors with core biopsies opens the door to the exploration of alternative approaches to tumor ablation. It separates the two goals of surgical removal of tumors: (1) to obtain diagnostic and prognostic information regarding the tumor; and (2) to excise the tumor for local control. Excision might be replaced with cryosurgery, focused ultrasonography, laser, or brachytherapy. If these approaches are less disruptive than surgery and can reduce the number of cancer cells released into the bloodstream, they will indeed be a step forward. If they are only new gimmicks with little true advantage they will only muddy the water.

Surgery's days as the gold standard of cancer treatment may be numbered. Surgeons must be on the forefront exploring new technologies for tumor diagnosis and treatment, and we need to do the appropriate studies to demonstrate that they are safe and effective for our patients.