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Pre-Biopsy Psychological Factors Predict Patient Biopsy Experience

S. J. Miller,

Mount Sinai School of Medicine, New York, NY, USA

J. B. Schnur,

Mount Sinai School of Medicine, New York, NY, USA

L. Margolies,

Mount Sinai School of Medicine, New York, NY, USA

J. Bolno,

Mount Sinai School of Medicine, New York, NY, USA

J. Szabo,

Mount Sinai School of Medicine, New York, NY, USA

G. Hermann,

Mount Sinai School of Medicine, New York, NY, USA

G. H. Montgomery, and

Mount Sinai School of Medicine, New York, NY, USA

S. J. Sohl

Vanderbilt University Medical Center, Nashville, TN, USA

Abstract

Purpose—Excisional/surgical breast biopsy has been related to anticipatory emotional distress, and anticipatory distress has been associated with worse biopsy-related outcomes (e.g., pain, physical discomfort). The present study was designed to investigate: a) whether anticipatory distress before an image-guided breast biopsy would correlate with biopsy-related outcomes (pain and physical discomfort during the biopsy); and b) whether type of distress (i.e., general anxiety, worry about the procedure, worry about biopsy results) would differentially relate to biopsy-related outcomes.

Methods—50 image-guided breast biopsy patients (mean age = 44.4 years) were administered questionnaires pre- and post-biopsy. Pre-biopsy, patients completed the Profile of Mood States-Tension/Anxiety subscale and two Visual Analog Scale items (worry about the biopsy procedure, worry about the biopsy results). Post-biopsy, patients completed two Visual Analog Scale items (pain and physical discomfort at their worst during the procedure).

Results—1) Pre-biopsy worry about the procedure was significantly related to both pain ($r=0.38$, $p=0.006$) and physical discomfort ($r=0.31$, $p=0.026$); 2) Pre-biopsy general anxiety was significantly related to pain ($r=0.36$, $p=0.009$), but not to physical discomfort; and 3) Pre-biopsy worry about the biopsy results did not significantly relate to pain or physical discomfort.

Conclusions—Worry about the procedure was the only variable found to be significantly correlated with both biopsy-related outcomes (pain and physical discomfort). From a clinical

perspective, this item could be used as a brief screening tool to identify patients who might be at risk for poorer biopsy experiences, and who might benefit from brief interventions to reduce pre-biopsy worry.

Keywords

Breast Biopsy; Anxiety; Pain

In the United States, 1.7 million women undergo breast biopsies each year [1]. Breast biopsy patients typically have substantial levels of anticipatory emotional distress [2-9]. In particular, prior to breast biopsy, patients experience general anxiety as well as specific worry about both the procedure itself and worry about the biopsy results (i.e., the diagnosis) [4;7]. Such anticipatory emotional distress has been related to poorer biopsy-related outcomes including increased pain and physical discomfort [10]. The literature, however, has focused almost exclusively on excisional/surgical breast biopsy patients, and it is unclear whether/how results will generalize to the more common image-guided biopsy.

An image-guided breast biopsy uses imaging (e.g., ultrasound, stereotactic, or MRI) to guide the physician as a large hollow needle is inserted to collect biopsy samples from the breast abnormality [11]. According to the American Society of Breast Surgeons, image-guided breast biopsy is the preferred method to diagnose image-detected breast abnormalities [12]. When compared to excisional/surgical breast biopsy, image-guided biopsy is less invasive, more cost effective, and causes minimal to no scarring on subsequent mammograms [13]. As image-guided biopsy is now the preferred method to detect breast abnormalities, it is important to better understand how pre-biopsy psychological factors influence the patient biopsy experience.

The present study was designed to investigate: a) whether pre-biopsy anticipatory emotional distress would relate to biopsy-related pain and physical discomfort in women receiving an image-guided breast biopsy; and b) whether type of distress (i.e., general anxiety, worry about the procedure, and worry about the biopsy results) would differentially relate to these outcomes.

Materials and Methods

Image-guided Breast Biopsy Procedures

At Mount Sinai Medical Center, when a suspicious mass/lump in the breast is detected by a mammogram, a follow-up breast ultrasound is performed. If a correlative mass is detected on the ultrasound, the mass is subjected to ultrasound guided biopsy. If no mass is found, or if the abnormality is a calcification, a stereotactic (mammogram-guided) biopsy is performed. The purpose of the image-guided breast biopsy (either stereotactic or ultrasound-guided) is to collect a sample of the suspicious breast finding and subsequently determine if it is malignant. MRI guided procedures were not included in this study.

Participants

Study eligibility criteria included: age 18 years or older, English speaking, and scheduled for a physician-recommended image-guided breast biopsy (stereotactic or ultrasound-guided). In total, 50 breast biopsy patients, recruited from a radiology clinic at Mount Sinai Medical Center, participated in the study (see Table 1). Of the patients recruited to the protocol ($n=68$), 73.5% agreed to participate ($n=50$). The patients who agreed to participate did not significantly differ from those who declined to participate on demographics or medical characteristics (e.g. biopsy type) (all p 's > 0.20).

Procedure

The study was approved by the Mount Sinai School of Medicine's Institutional Review Board (IRB). Patients were referred to the study by their radiologist, and recruited by a research assistant on the day of their breast biopsy, prior to the biopsy. If patients agreed to participate, they were asked to complete one brief pre-biopsy questionnaire packet within one hour before the breast biopsy. Then, after the biopsy, before leaving the radiology clinic, participants completed a second brief post-biopsy packet.

Measures

The pre-biopsy packet assessed demographic information, general anxiety, worry about the procedure, and worry about the biopsy results. 1) *Demographic/medical history* was assessed with a questionnaire that included questions about age, race, ethnicity, marital status, education, and previous breast biopsy experience. 2) *General anxiety* was assessed with the Tension-Anxiety subscale of the Short Version of the Profile of Mood States (SV-POMS) [14], a 6-item self-report scale. Total scores range from 0-24, where higher scores indicate elevated feelings of general anxiety. Previous research has found the measure to be reliable and valid in breast cancer settings [15]. 3) *Worry about the procedure* was assessed with a Visual Analog Scales (VAS) item that asked: "Thinking about your procedure, how worried are you about the procedure itself and what the doctor will do during the procedure?" The VAS score ranged from 0-100, where higher scores indicate more worry. 4) *Worry about the biopsy results* was assessed with a VAS item that asked: "Thinking about your procedure, how worried are you about what the doctor may find?" The VAS score ranged from 0-100, where higher scores indicate more worry.

The post-biopsy questionnaire assessed pain and physical discomfort during the procedure. 1) *Pain during the procedure* was assessed with a VAS item that asked: "At its worst, during the procedure, how much pain did you feel?" The VAS ranged from 0-100 where higher scores indicate more pain. 2) *Physical discomfort during the procedure* was assessed with a VAS item that asked: "At its worst, during the procedure, how much physical discomfort did you feel?" The VAS ranged from 0-100 where higher scores indicate more physical discomfort. The use of VAS questions has been well supported in previous breast cancer studies (e.g., [10]). Post-biopsy, the biopsy procedure type (stereotactic, ultrasound-guided) was also recorded.

Results

All data were analyzed using SAS 9.2 [16]. Descriptive statistics of studied variables are as follows: pre-biopsy general anxiety ($M = 9.2$, $SD = 5.9$), pre-biopsy worry about the procedure ($M = 42.9$, $SD = 35.0$), pre-biopsy worry about the biopsy results ($M = 56.6$; $SD = 37.7$), biopsy-related pain ($M = 52.9$, $SD = 25.4$), and biopsy-related physical discomfort ($M = 34.6$, $SD = 31.7$). No variables demonstrated problems with skewness or kurtosis (all values were between + 2.0 and - 2.0).

The analyses revealed that neither demographic variables (age, ethnicity, race, marital status, education), nor having had a previous breast biopsy, were significantly related to pain or physical discomfort during the biopsy (all p 's > 0.11). Patients who underwent stereotactic biopsy had significantly more physical discomfort during the procedure than those who had ultrasound-guided biopsies [$F(1, 48)=13.24$, $p < 0.001$]. Pain during the procedure did not differ by biopsy procedure type (all p 's > 0.37).

As outlined in Table 2, the three independent variables (general anxiety, worry about the procedure, and worry about the biopsy results) were significantly related to each other (all p

$\zeta < .001$). Bivariate correlations (see Table 2) revealed that increased pre-biopsy worry about the procedure was significantly related to increased levels of both pain and physical discomfort during the biopsy. Bivariate analyses also found that increased general anxiety was significantly related to increased pain during the biopsy, but not to physical discomfort. Increased pre-biopsy worry about the biopsy results, however, did not significantly correlate with biopsy-related pain or physical discomfort.

Using a variable reduction strategy, those variables found to be significant correlates of the outcomes in the bivariate analyses were entered into two multiple regressions in order to identify unique predictors of biopsy-related pain and physical discomfort. An analysis of the variance inflation (VIF) and tolerance revealed that multicollinearity was not influencing the regression analyses results (all VIFs ranged from 1.02 – 1.46; all tolerances ranged from 0.69-0.98). First, procedure type and worry about the procedure were entered into a regression to predict biopsy-related physical discomfort, as each correlated with physical discomfort in bivariate analyses. The overall model was significant [$F(2, 47) = 10.40, p < .001$] and accounted for 31% of the variance in physical discomfort. Both procedure type [$F(1, 47) = 14.12, p < .001$] and worry about the procedure [$F(1, 47) = 9.58, p < .001$] uniquely predicted biopsy-related physical discomfort. A second regression revealed that, together, general anxiety and worry about the procedure significantly predicted biopsy-related pain [$F(2, 47) = 5.14, p < .01$] and accounted for 18% of the variance; however, neither variable was uniquely related to pain during the biopsy (all $p\zeta > .10$).

Discussion

The present study demonstrated that emotional distress prior to image-guided breast biopsy is correlated with pain and physical discomfort during the biopsy. These findings are consistent with previous research that has found that emotional distress prior to excisional/surgical breast biopsy is correlated with adverse biopsy outcomes including increased pain ($r = .36, p = .004$) and physical discomfort ($r = .33, p = .009$) [10]. The current study adds to the previous research by beginning to explore the different types of distress (e.g., general distress, worry about the procedure, worry about the biopsy results) that are related to pain and discomfort during an image-guided biopsy. The results found that the type of distress does, in fact, differentially relate to image-guided biopsy outcomes. In particular, the present study suggests that pre-biopsy worry about the procedure was related to both biopsy outcomes (pain and physical discomfort), pre-biopsy general anxiety was related to one of the biopsy outcomes (pain), and worry about the biopsy results was not significantly related to either biopsy outcome.

Of all the independent variables measured (i.e., general anxiety, worry about the procedure, worry about the biopsy results), worry about the procedure was the only measure that correlated with *both* biopsy-related pain and physical discomfort. In particular, the results suggest that increased worry about the procedure is related to worsened pain and physical discomfort, whereas decreased worry about the procedure is related to lower levels of pain and physical discomfort. It is important to note that pre-biopsy anxiety and/or worry can be a normal response in the face of a potentially life threatening disease. However, even when pre-biopsy emotional distress is a normal response, the study results suggest that women who experience higher levels of such distress are at greater risk for increased adverse biopsy-related outcomes. Reducing, to any degree possible, such pre-biopsy distress has the potential to improve the biopsy experience for patients.

Our results suggest that a simple one-item VAS assessing worry about the procedure may be the most useful and time-efficient clinical indicator of poorer biopsy-related experiences. As such, providing patients, on the day of the biopsy, with a single item VAS assessing worry

about the procedure may be useful for identifying patients who would benefit from brief, distress-reducing interventions either before or during the biopsy procedure. Behavioral interventions, such as hypnosis, have been shown to be efficacious in reducing distress and improving pain and/or discomfort in both image-guided breast biopsy patients [17] and excisional/surgical breast biopsy patients [5;18;19]. Pharmacologic interventions (e.g., benzodiazepines) have also been shown to be efficacious in reducing pre-biopsy distress in excisional/surgical biopsy patients [20].

Additionally, the results suggest that stereotactic breast biopsy is related to more physical discomfort than ultrasound guided breast biopsy. Several clinical factors may explain this finding. In particular, the ultrasound biopsy procedure is performed with the patient supine (face up) with her arm raised. In contrast, the stereotactic biopsy procedure is performed with the patient prone (face down), the arm extended, the neck turned to one side and the breast compressed. In addition, typically the stereotactic biopsy procedure takes longer than the ultrasound guided biopsy. Future research should examine other clinically relevant factors (e.g., location of the tumor) that may further contribute to adverse biopsy-related outcomes.

There are limitations to the present study that should be considered when interpreting and applying the results. First, the sample size was small and it is possible that larger sample studies would be able to better detect unique associations between the predictors and the outcomes. However, from a clinical perspective, the potential utility of the one-item approach is apparent. A second limitation is that the current study exclusively examined the predictive effects of state-specific psychological characteristics (i.e., worry and anxiety) and did not examine the predictive role of trait characteristics (e.g., neuroticism) that may place a woman at risk for poor biopsy-related outcomes. However, in order to minimize patient burden and maximize the clinical utility of a pre-biopsy screener, it was decided to solely assess pre-surgical psychological constructs that are amenable to brief behavioral or pharmacological interventions. Finally, although the study provides strong support for the relationship between worry about the procedure and biopsy-related outcomes (i.e., pain and physical discomfort) it is unclear what components of the biopsy are in fact worrisome. Future qualitative research should explore the content of these patients' worry. Such research could inform tailored preventive interventions designed to assuage women's worry about image-guided biopsy.

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Table 1
Sample Characteristics

Descriptive Information	
Age Range: 22-66 years	<i>M(SD)</i> 44.4 (10.2)
<i>Procedure Type</i>	n (%)
Ultrasound-guided	25 (50%)
Stereotactically-guided	25 (50%)
<i>Previous Breast Biopsy</i>	
Yes	16 (32%)
No	34 (68%)
<i>Race</i>	
White	29 (58%)
Black	12 (24%)
Other	9 (18%)
<i>Ethnicity</i>	
Hispanic	28 (56%)
Non-Hispanic	22 (44%)
<i>Education</i>	
College degree or post-graduate degree	28 (56%)
< College degree	22 (44%)
<i>Marital Status</i>	
Currently married	20 (40%)
Not currently married	30 (60%)

Table 2

Correlation Matrix among Study Variables

	SV-POMS: T/A	Worry-RESULT	Worry-PROCEDURE	Pain	Physical Discomfort
SV-POMS: T/A	--	0.62 ***	0.56 ***	0.36 **	0.09
Worry-RESULT	--	--	0.67 ***	0.21	0.17
Worry-PROCEDURE	--	--	--	0.38 **	0.31 *
Pain	--	--	--	--	0.53 ***
Physical Discomfort	--	--	--	--	--

*
p < .05,

**
p < 0.01,

***
p < .001

Note: SV-POMS: T/A = Tension-Anxiety subscale of the Short Version – Profile of Mood States, Worry-FIND = worry about the biopsy results, Worry-PROCEDURE = worry about the procedure.