STRAND DIAGNOSTICS
know error

As presented at the:

SAN ANTONIO BREAST CANCER SYMPOSIUM

Incidence of Misattributed Specimen Provenance Among Surgical Breast Biopsies

OVERVIEW

The medical literature reports extensively on the diagnostic challenges posed by tissue contamination and transposition among surgical biopsy specimens. These **specimen provenance complications (SPCs) can lead to a misdiagnosis of cancer** when no cancer is present, resulting in unnecessary surgery or other non-indicated therapy in an otherwise healthy patient, and a potential delayed diagnosis of a reciprocal patient. The histopathology process involves many manual steps during which specimens must be estranged from their identification, and provenance errors are often invisible absent DNA analysis. Prostate biopsy is the clinical setting in which specimen provenance has been most widely studied, with **complication rates reported to persist in over 0.9% of positive diagnoses** despite best efforts to minimize errors. Because the processing workflow is virtually identical for histopathology specimens of all types, there is reason to expect that error rates among breast biopsy specimens are similar to prostate, though data validating this expectation have not previously been available.

METHODS:

We analyzed a dataset of over **4,200 patients diagnosed with breast cancer between February 2011 and April 2014**. All biopsies were collected using a uniform best-practice protocol including forensic chain of custody principles, bar-coding of specimen containers, and collection of the patient's reference DNA sample via buccal swab during the biopsy procedure. After a pathologic diagnosis of breast cancer was made, a portion of the diagnostic specimen was forwarded to an independent DNA laboratory (Strand Diagnostics, Indianapolis, IN) where genetic short tandem repeat profiles were compared to the patient's reference DNA to rule out the presence of undetected SPCs prior to proceeding with therapy.

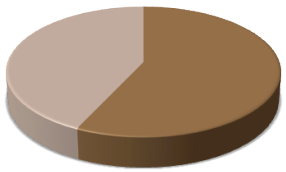
RESULTS:

3,545 breast cancer cases from 7 practices contributing 100 or more cases each were examined (Fig.1). DNA testing revealed occult provenance complications in 16 cases (0.45%), of which 6 (0.17%) were a complete transposition with another patient and 10 (0.28%) reflected contamination of the specimen by tissue from one or more unidentified individuals. Four (57%) of the practices experienced at least one provenance error

Figure 1. SPCs by Practice

Type 1: Transpositions Type 2: Contaminations

	Cases	Type 1 Errors	Type 2 Errors	SPC Rate
Practice A	2,205	4	8	**0.54%**
Practice B	617	0	0	0.00%
Practice C	173	0	0	0.00%
Practice D	162	0	1	**0.62%**
Practice E	142	2	0	**1.41%**
Practice F	128	0	1	**0.78%**
Practice G	118	0	0	0.00%
TOTAL	3,545	6	10	0.45%



57% of Practices

(continued on reverse)

RESULTS (continued):

during the study period, with the highest error rate being 1.41% at one practice. Pathology was performed by 14 different laboratories, 6 (43%) of which were implicated in occult SPCs (Fig. 2). Finally, patients seen by 8 (13%) of the 61 physicians performing surgical biopsies in the cohort were subjects of occult specimen provenance errors.

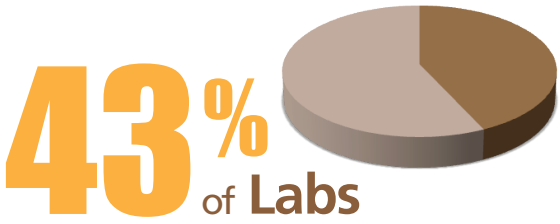


Figure 2. SPCs by Laboratory
Type 1: Transpositions Type 2: Contaminations

	Cases	Type 1 Errors	Type 2 Errors	SPC Rate
Lab A	1,435	2	4	**0.42%**
Lab B	967	0	3	**0.31%**
Lab C	430	0	0	0.00%
Lab D	260	2	1	**0.77%**
Lab E	182	0	0	0.00%
Lab F	84	0	1	**1.19%**
Lab G	78	0	0	0.00%
Lab H	71	2	0	**2.82%**
Lab I	20	0	0	0.00%
Lab J	9	0	2	**22.22%**
Lab K	5	0	0	0.00%
Lab L	2	0	0	0.00%
Lab M	1	0	0	0.00%
Lab N	1	0	0	0.00%
TOTAL	**3,545**	**6**	**10**	**0.45%**

OVER ALL ERROR RATE .45%

SUMMARY:

These data, while limited in statistical power, suggest that the incidence of SPCs among breast biopsies is comparable to that previously reported for prostate biopsies, and that errors are distributed broadly across laboratories, practices, and physicians. Due to the potential clinical consequences for patients with undetected SPCs, and the medical malpractice implications, further study of the nature and economics of provenance complications in the breast biopsy setting is warranted.

REFERENCE:

Pfeifer JD, Liu J. Rate of Occult Specimen Provenance Complications in Routine Clinical Practice. *American Journal of Clinical Pathology*. 2013;139:93-100.

A. Lerner, MD, ABTC LLC.; A. Bush, Ph.D, Strand Diagnostics LLC.; A. Kenler, MD, Bridgeport Hospital, Yale New Haven Health, Bridgeport, CT.; D. Dorfman, MD, Zwanger-Pesiri; T. Morgan, Strand Diagnostics LLC.; B. Boyd, RN, ABTC LLC.; William Burak, MD, ABTC LLC.; R. Fine, MD, ABTC LLC. San Antonio Breast Cancer Symposium Poster Content. December 12, 2014.