Frozen Section Diagnosis

Is There Discordance Between What Pathologists Say and What Surgeons Hear?

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ABSTRACT

Objectives: Communication in various medical settings is subject to misinterpretation. The frozen section (FS) diagnosis in patient care is dependent on successful communication between pathologists and surgeons. However, very few studies looking at FS errors analyzed postanalytic communication issues.

Methods: A total of 300 consecutive cases, in which an FS was performed and corresponding surgical note was available, were studied. The FS diagnosis and surgeon’s interpretation were recorded for all cases. Discrepancies were classified as major (clinical impact) or minor (no clinical impact).

Results: We found 8 (2.7%) miscommunications, all with only minor clinical impact. These were attributed mainly to the surgeon’s misinterpretation of a deferred diagnosis. Also contributing to miscommunication was the pathologist’s use of nonspecific terminology such as “favor” or “scattered.”

Conclusions: We found that the rate of miscommunicated FS diagnoses was low at our institution during the period of our study. However, the rate of miscommunication was similar to the much more widely recognized problem of sampling error.

Frozen section (FS), one of the most valuable intraoperative tools for case management, involves teamwork among pathologists, pathology trainees, and sometimes pathology assistants. Performing an FS analysis is a multistep process, beginning with retrieval of the specimen from the patient by the surgeon followed by intraoperative preparation of slides, their microscopic examination, possible specimen triage for further workup, and finally rendering the FS diagnosis. One of the critical components in this workflow is communicating the FS diagnosis to the surgical team. The surgeon is typically waiting in the operating room (OR) with the patient to determine how best to proceed with their surgery based on the FS result. The FS diagnosis is usually communicated verbally to the surgeon via telephone, intercom, sometimes in person by the pathologist or a resident, in some situations via an intermediary (eg, nurse or other OR personnel), or less commonly using videoconferencing.

Technical issues, sampling error, diagnostic error, and errors in communication of diagnosis may result in FS errors. No matter how trivial the process of communication may sound, a miscommunication between the pathologist and surgeon may result in possible significant mismanagement of the case. From a medicolegal standpoint, the pathologist “reading” the FS may be liable for any harm to the patient. Because an FS diagnosis is often associated with a significant impact on immediate surgical decisions (frequently irreversible), several investigators, including national organizations like the College of American Pathologists (CAP), have documented the precision, accuracy, and reliability of FS by correlating intraoperative and final diagnosis. Important FS practice parameters (eg, concordance rates, deferral rates), recommendations, and incorporation of these parameters into
laboratory accreditation and inspection checklists were made by the CAP based on these accrued data.3,12-15

The focus of prior studies pertaining to FS has involved the correlation of FS with the final diagnosis and turnaround time of the FS analysis. In this study, our aim was to examine the communication between pathologists and surgeons during an intraoperative FS consultation.

Materials and Methods

Following institutional review board approval, this study was conducted in the Department of Pathology at the University of Pittsburgh Medical Center (UPMC) at 1 hospital (UPMC Shadyside, Pittsburgh, PA). We used the anatomic pathology laboratory information system (CoPathPlus, Cerner, Kansas City, MO) to retrieve a total of 327 consecutive surgical pathology FS cases that were performed over a 9-month period in 2009. Almost all FS diagnoses were reported verbally via telephone/intercom system to the OR. A few surgeons always came to the FS room, in which case the FS diagnosis was rendered directly to the surgeon during review of the slides under the microscope. Subsequently, the pathologist wrote the FS diagnosis on the FS requisition sheet, which was then transcribed verbatim by the prosector into the laboratory information system. No FS cases performed via telepathology were included. Cases were included only if they had a corresponding operative note in the electronic medical record (EMR) (Medical Archival and Retrieval System, UPMC). As a result, 27 (8.3%) cases without operative notes were excluded from the study.

An operative note in the EMR database is an indexed textual data field that is presented in HTML format in a web browser. An OR note is typically dictated/entered by a surgical trainee (intern, resident, or fellow) and subsequently electronically signed off by the attending surgeon. A few surgeons always came to the FS room, in which case the FS diagnosis was rendered directly to the surgeon during review of the slides under the microscope. Subsequently, the pathologist wrote the FS diagnosis on the FS requisition sheet, which was then transcribed verbatim by the prosector into the laboratory information system. No FS cases performed via telepathology were included. Cases were included only if they had a corresponding operative note in the electronic medical record (EMR) (Medical Archival and Retrieval System, UPMC). As a result, 27 (8.3%) cases without operative notes were excluded from the study.

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<table>
<thead>
<tr>
<th>Keyword</th>
<th>% of Successful Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen</td>
<td>68</td>
</tr>
<tr>
<td>Pathol</td>
<td>15</td>
</tr>
<tr>
<td>Biopsy</td>
<td>8</td>
</tr>
<tr>
<td>Margin</td>
<td>4</td>
</tr>
<tr>
<td>Polys</td>
<td>3</td>
</tr>
<tr>
<td>Culture</td>
<td>2</td>
</tr>
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</table>

* Arranged in decreasing order of successful hits.

The communicated FS diagnosis of each miscommunication was critically reviewed, and in these cases the patient’s outcome was noted. Based on this clinical outcome, a miscommunication was further classified as “major” (which had significant clinical impact on patient outcome) or “minor” (there was no significant clinical impact on patient outcome). We also categorized miscommunications into 3 groups based on the nature of the miscommunication: group I involved miscommunicating diagnoses with numerical values; group II involved miscommunicating diagnoses with nonnumerical values; and group III involved miscommunication related specifically to grading of neoplastic lesions.

FS Overview

Various specimen types were received for FS during the time frame of this study, which included bone and soft tissue, genitourinary, skin, lung, and gastrointestinal tract samples. Figure 1. FS requests included asking for a diagnosis of a lesion (59.3%), margin status of a resected specimen containing malignancy (30.6%), both a diagnosis of a lesion and grading of neoplastic lesions (6.6%), or lymph node status for the presence of metastatic tumor (3.5%) Figure 2. Of the specimens sent for diagnosis of a lesion, 47.7% (84/176) were neoplastic lesions and 52.3% (92/176) were nonneoplastic lesions. The majority (91.3%, 84/92) of the nonneoplastic lesions were evaluated for evidence of acute inflammation in bone and joint tissue.

Results

FS Overview

The FS–final diagnosis concordance rate was 97.6%. The corrected (deferrals excluded) and uncorrected discordance
rates between FS and permanent sections were 2.4% and 2.0%, respectively. The deferral rate was 16.6%. In 6 cases (2%), the FS and final pathologic diagnoses were discordant predominantly because of sampling error; however, there was no miscommunication of these FS diagnoses to the OR.

**Miscommunications**

Overall, there were 2.7% (8/300) miscommunications, all of which had only minor clinical impact. The majority (88%, 7/8) of these FS diagnoses were deferred until permanent sections were reviewed. Five (62.5%) cases required a diagnosis of a lesion, 2 (25%) required evaluation of margin status, and 1 case (12.5%) involved a lymph node FS looking for metastatic cancer. Six (75%) cases with miscommunication had a clinical diagnosis of malignancy, and 2 (25%) benign cases were evaluated for the presence of infection in joint and bone tissue. In 2 of these 8 cases, multiple parts were examined during FS. Among these cases, 25% (2/8), 50% (4/8), and 25% (2/8) were classified as group I, II, and III, respectively.

In group I (numerical miscommunications), 2 separate cases were misinterpreted by the surgeons. An FS report of borderline (“about” 10/high-power field [hpf]) was interpreted as “>10/hpf,” while a report of “scattered” (<10/hpf) was misinterpreted as “loaded” with neutrophils. The final diagnoses in these cases were negative for acute inflammation (<10/hpf).

In group II (nonnumerical, n = 4), an FS on an adrenal gland lesion was deferred until permanent sections were reviewed because of an inability to distinguish benign adrenal gland tissue from renal cell carcinoma. This case was interpreted by the surgeon as “an adrenal adenoma” in the operative note. The final diagnosis was negative for neoplasia. In another case, an FS diagnosis of low-grade spindle cell lesion of the retroperitoneum in the context of a prior history of renal tumor was interpreted by the surgeon as an inflammatory mass/lesion. The final diagnosis, however, was negative for neoplasia (fat necrosis and chronic inflammation). In a third case, a soft tissue mass in the knee was deferred “favoring” a malignant lesion. The FS quality was poor because of a tissue processing issue, which was documented in the FS diagnosis. However, the operative note documented with high confidence that this was a malignant lesion. The final diagnosis, however, was negative for neoplasia. In a fourth case, an FS of a lymph node that did not show evidence of carcinoma; however, the FS findings were suspicious for a lymphoproliferative neoplasm. The specimen was accordingly triaged and sent for flow cytometry. The operative note did not document the possibility of a lymphoma at all (“…frozen section came back negative”). The final diagnosis turned out to be negative for metastatic carcinoma and lymphoma.

In group III (n = 2), the grade of neoplastic lesions was miscommunicated. A spindle cell lesion “favoring” sarcoma, in which the pathologist had not commented on the grade during the FS, was interpreted as a high-grade sarcoma. Similarly, in another case in which an FS diagnosis used the
confusing phrase “Defer; positive for urothelial dysplasia,” was interpreted by the surgeon as an “excellent margin.” The final diagnosis in this case was mild urothelial dysplasia.

Discussion

In spite of the many claims published in the medical literature and in national newspapers that communication is an important source of error, FS communication issues have received little attention. According to the Joint Commission, an estimated 80% of serious medical errors are the result of miscommunication among health care professionals. Successful communication has been reported to consist of 3 key points: (1) the sender conveys the message in a clear and straightforward manner, (2) the receiver accepts the message and confirms that he/she has comprehended it, and (3) the sender verifies that the message was understood and received in the manner intended. For FS, all 3 points are vital to ensure effective communication of the rendered diagnosis. The American College of Radiology has formulated standards for communication in diagnostic radiology. However, the practice of pathology, particularly FS analysis, lacks similar guidelines. Instead, pathologists acquire communication skills over time. Further, larger studies may be required to establish guidelines for effective communication in pathology.

An FS analysis is a multistep process and thereby prone to errors at any one step or due to a combination of steps in the process. Figure 3 shows the standard workflow in a typical FS event. Unlike a linear multistep process, FS analysis involves communication feedback loops between the pathologist and OR personnel (surgeon, surgical trainee, or the ancillary OR support staff) and often also the FS room personnel (eg, pathology trainees, pathology assistant, histotechnologist). Ideally the pathologist should report the FS findings directly to the operating surgeon. However, this may not always be practical (eg, the surgeon may be busy operating and unavailable). In such cases, another member of the surgical team should be informed. It is recommended by some authors that an FS diagnosis should not be transmitted via OR orderlies, nurses, or other staff. The communication loops form an important part in rendering an FS diagnosis. Effective communication during an FS analysis process allows the pathologist to check whether the diagnosis was received and understood or whether the information generated further questions.

The implications of a miscommunicated diagnosis can be serious because a discordant diagnosis can subsequently result in incorrect patient care. Clear, concise, and skillful communication is an essential component of the FS. Communication during intraoperative consultation may be influenced by the complexity of the case, proximity of the FS suite to the OR, communication facilities available (eg, phone, intercom, and videoconferencing), and the institution’s practice (eg, some surgeons may prefer to view the case at the microscope with the pathologist). One institution developed customized software (FSLink, Yale University, New Haven, CT) that allows real-time sharing of electronic information (ie, written diagnoses and even images if required) with the OR on their computer monitor.

Communicating a diagnosis that is complicated or cannot be made definitively by the pathologist (ie, the case may be deferred) is typically more challenging. By definition, a diagnosis is deferred when the pathologist is not able to make a clear-cut diagnosis for various reasons. The final diagnosis is rendered on permanent histologic study. Indeed, this may explain why the majority (88%; 7/8) of
miscommunications in our study involved cases in which the FS diagnosis was deferred. The overall deferral rate for all FS in our study was 16.6%. This is higher than the rate reported in some prior studies, such as 2 CAP Q-Probe studies with published deferral rates of 4.2% and 4.6%.\textsuperscript{13,15} This may reflect the high proportion of specialized FS (eg, bone and soft tissue pathology, which often require ancillary studies and molecular testing) being performed at the chosen hospital in our study. Coffin et al\textsuperscript{25} reported an even higher (25%) deferral rate in their study of FS in a pediatric surgical pathology setup, because many of their cases required ancillary studies for a definitive diagnosis.

To our knowledge, in only 1 prior similar study, conducted at the University of Nebraska Medical Center, did the investigators examine the postanalytic FS errors.\textsuperscript{26} They found that in 22% of their cases, intraoperative diagnoses were not documented by the surgeon. In addition, these authors uncovered minor inconsistencies among surgeons’ operative notes (eg, definitive diagnosis given when the original FS was deferred) in 8% of cases, differing diagnoses with minimal clinical impact in about 1% of cases, and a possible major impact (eg, benign versus malignant) in approximately 1% of cases. However, they found that the method of communication with the surgeon (in person or via phone) did not affect the type of error. We evaluated the role of communication between pathologists and surgeons when rendering an FS diagnosis by comparing the pathologist’s documented intraoperative diagnosis in the laboratory information system with that of the surgeon in the EHR. The widespread availability of EMRs at our institution greatly facilitated this study. One limitation of this archival study is that we did not record the method of communication (eg, in person or via telephone) or whether the pathologist spoke directly with the surgeon or

<table>
<thead>
<tr>
<th>Category</th>
<th>Surgeon’s Interpretation</th>
<th>Final Diagnosis</th>
<th>Clinical Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Synovial tissue with &gt;10/hpf neutrophils</td>
<td>Negative for acute inflammation (&lt;10 neutrophils/hpf)</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>FS of it showed likely adrenal adenoma</td>
<td>Adrenal tissue, negative for malignancy</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>The specimen was then removed with what appeared to be excellent margins</td>
<td>Portion of ureter with mild urothelial dysplasia</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Results came back consistent with inflammation</td>
<td>Adipose tissue with fat necrosis and chronic inflammation, negative for neoplasia</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>FS has had clear evidence of malignancy</td>
<td>Aneurysmal fibrous histiocytoma</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>The tissue sent for FS was loaded with polymorphonuclear leukocytes and was felt to be consistent with infection</td>
<td>Marrow margin, negative for acute inflammation, osteomyelitis, or malignancy</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>The FS came back negative</td>
<td>Negative for carcinoma and lymphoma</td>
<td>No</td>
</tr>
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</table>

![Figure 3](image-url) Typical workflow of a frozen section (FS) event. OR, operating room.
other OR staff. A potential cause for “pseudo-error” in communication is inappropriate interpretation of FS diagnosis by a trainee (intern, resident, or fellow) while dictating or entering the FS diagnosis in the OR note. This interpretive error may not be shared by the attending surgeon in the OR. Because the majority of OR notes in our institution are dictated by trainees and electronically signed off by the attending surgeons, this potential error could not be investigated, which is another limitation of this study.

The miscommunication rate in our study was 2.7% (8/300). Two of these 8 cases (25%) were multipart specimens, 2 and 3 parts, respectively. Multipart specimens for FS can complicate the workflow, especially increasing chances of errors during communicating part-specific diagnoses. This is compounded by the fact that often multipart cases span the entire day and more than 1 pathologist may be involved in FS analysis of the same case, which may also lead to miscommunications. However, miscommunication in these 2 cases was not related to the multipart nature of the specimens. Challenging FS cases with deferred diagnoses add another level of complexity.

The specimen type in which miscommunication occurred most frequently was bone and soft tissue lesions (62.5%; 5/8). This is to be expected because FS of soft tissue and bone lesions are inherently challenging, and clinical and imaging correlation is often necessary. The latter involves effective communication with the surgeon, which is critical for rendering an accurate FS diagnosis.

Half of the miscommunications in our study involved cases in group II. This group is the broadest group and encompasses almost all nonnumerical diagnoses. Unlike numerical diagnoses, FS diagnoses in group II can be either binary (positive or negative) or descriptive (deferred diagnosis). The latter increases the likelihood of miscommunication and makes this category most prevalent and important. Another important observation in our study was the frequent use of nonstandard pathology terminology when reporting an FS diagnosis. This includes the use of “favor,” “about,” “versus,” and “scattered” in the final FS diagnosis. Also, miscommunication likely resulted when the pathologist used a combination of confusing terms (eg, “defer, left ureter positive for dysplasia” because positive indicates a definitive diagnosis, whereas defer indicates uncertainty in the diagnosis). Moreover, verbose diagnoses were noted in some of the miscommunicated cases. Communicating diagnoses with lengthy pathologic descriptions and use of nonstandard terminologies may be confusing to the surgeon and increase chances of potential miscommunication.27 This is likely to create a significant problem when such descriptive diagnoses are conveyed via OR support staff who may be unfamiliar with several of the medical terms used in the FS diagnosis.

In summary, this article highlights the fact that miscommunication between the pathologist and surgeon is a potential source of errors in FS. In fact, noteworthy differences have been well documented between what a pathologist intends to say versus what a surgeon hears.28 Although we found that our rate of miscommunication was quite low, it was similar to our rate of sampling error at the time of FS analysis. Fortunately the rate of miscommunication in our study was low, and when miscommunications occurred, they did not result in patient harm.

The results of this study revealed some important pitfalls related to communicating an FS diagnosis. Such postanalytic FS errors may stem from ineffective (verbal) communication by the pathologist, inaccurate transmission of the message (eg, via ancillary OR staff), or misinterpretation of the message by the surgeon. We also found that miscommunication was frequently associated with deferred diagnoses in complex cases. In such cases, good communication skills are necessary to suitably explain the deferred diagnosis to the surgeon. Also, based on our findings, miscommunication can be avoided by keeping FS diagnoses brief and avoiding the use of nonstandard or conflicting terminology.

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References


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