Routine Pathologic Evaluation of Plastic Surgery Specimens: Are We Wasting Time and Money?

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Background: Recent health care changes have encouraged efforts to decrease costs. In plastic surgery, an area of potential cost savings includes appropriate use of pathologic examination. Specimens are frequently sent because of hospital policy, insurance request, or habit, even when clinically unnecessary. This is an area where evidence-based guidelines are lacking and significant cost-savings can be achieved.

Methods: All specimen submitted for pathologic examination at two hospitals between January and December of 2015 were queried for tissue expanders, breast implants, fat, skin, abdominal pannus, implant capsule, hardware, rib, bone, cartilage, scar, and keloid. Specimens not related to plastic surgery procedures were excluded. Pathologic diagnosis and cost data were obtained.

Results: A total of 759 specimens were identified. Of these, 161 were sent with a specific request for gross examination only. There were no clinically significant findings in any of the specimens. There was one incidental finding of a seborrheic keratosis on breast skin. The total amount billed in 2015 was $430,095.

Conclusions: The infrequency of clinically significant pathologic examination results does not support routine pathologic examination of all plastic surgery specimens. Instead, the authors justify select submission only when there is clinical suspicion or medical history that warrants evaluation. By eliminating unnecessary histologic or macroscopic examination, significant cost savings may be achieved. (*Plast. Reconstr. Surg.* 141: 812, 2018.)

As health care spending in the United States continues to rise,[1] physicians are being faced with increased pressure to cut costs. All physicians, including plastic surgeons, must critically assess their practices and apply evidence-based principles to decrease costs without compromising patient care.[2] Limited data exist regarding the cost of sending surgical specimens for routine pathologic evaluation.[3] This represents an area where evidence-based guidelines are lacking and significant cost-savings can be achieved.

Although specific practices may vary by institutional guidelines or by the discretion of the surgeon,[4,5] many specimens are sent for evaluation simply because of hospital policy or insurance request, even when clinically unnecessary. Although processing and interpreting these specimens generate revenue for the hospital, they are an additional financial burden to patients, insurance companies, and taxpayers. In addition, many of the specimens that are commonly sent for testing, such as nasal cartilage from a routine rhinoplasty or fat from a lipectomy, have a low index of suspicion for pathologic findings and are ultimately benign. Of course, macroscopically abnormal samples warrant examination by a pathologist. Other specimens, such as breast tissue removed during a breast reduction, should be sent for pathologic evaluation because of the potential for pathologic findings in breast tissue with no radiologic findings.[6,7]

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In the United Kingdom, where health care cost is a major factor in decision-making, the Royal College of Pathologists has released guidelines regarding the use of pathologic examination; however, they conclude that "relatively few departments have attempted to implement these guidelines."[8] In the United States, the College of American Pathologists' "Policy on surgical specimens to be submitted to pathology for examination" recommends pathologic examination of some plastic and reconstructive surgery samples, but ultimately leaves the decision to the discretion of individual institutions and provides no evidence-based guidelines.[9] Neither organization comments on the cost of pathologic examination or any potential cost-saving measures.

Other surgical specialties have investigated the utility of routine pathologic evaluation. Routine examination of tonsillectomy and adenoidectomy specimens was found to be not cost effective, with the average cost necessary to detect one case of potentially significant disease totaling $64,718.[10] Likewise, a retrospective chart review of total joint arthroplasties over a 2-year period at a single institution found no cases in which patient care was altered by routine pathologic examination.[11] Multiple studies of general surgery procedures have shown that pathologic examination of low-risk specimens, such as hernia sacs and gallbladders, rarely results in a diagnosis that affects patient care.[12–17] To date, no large-scale studies have been performed that investigate the utility of pathologic examination of common plastic surgery specimens.

The authors believe that a majority of low-risk specimens sent by plastic surgeons do not need to undergo pathologic analysis and instead add a considerable cost to the patient's care.[18,19] Evidence-based guidelines on the use of pathologic examination by plastic surgeons are lacking and, if introduced and implemented, may result in a significant cost-saving without compromising quality of care. The authors determined to investigate the incidence of clinically significant pathologic findings in plastic surgery pathologic examination specimens at two tertiary care hospitals to help develop evidence-based guidelines.

METHODS

A 12-month (January to December of 2015) review of all specimen submissions for pathologic examination at two large tertiary care hospitals was performed. A database of specimens was queried for submissions labeled as follows: tissue expanders, breast implants, fat, skin, abdominal pannus, implant capsule, hardware, rib, bone, cartilage, scar, and keloid. A total of 1318 unique entries were identified. Specimens not related to plastic surgery procedures were excluded, resulting in 759 unique specimens. Preoperative and final pathologic diagnoses were reviewed and recorded.

Hospital billing records were queried to obtain the amount billed for processing and professional interpretation of each specimen. The total amount collected for professional interpretation of each specimen was also obtained. In addition, the annual volumes of select plastic surgery procedures were obtained.

RESULTS

A total of 759 unique specimens were identified (Table 1). There were 353 cartilage specimens, 166 rib specimens, and 86 scar specimens, of which 19 were breast scars. There were 60 breast implants and 31 skin specimens, of which 21 were breast skin. There were 30 implant capsules, 21 tissue expanders, eight panni, and four keloids.

A total of 132 unique patients generated 151 breast specimens (i.e., breast skin, scar, capsule, implant, or expander). Of these patients, 91 (68.9 percent) had a preoperative diagnosis of breast cancer or *BRCA* genetic mutation. Thirteen patients (9.9 percent) were cosmetic. Of the 94 patients who generated 166 rib specimens, 93 (98.9 percent) had a preoperative diagnosis of breast cancer or *BRCA*. Cartilage specimens were all from unique patients (353 patients), of whom 269 (76.2 percent) had a preoperative diagnosis of deviated septum or septoplasty. Sinusitis was a preoperative diagnosis in 62 patients (17.6 percent), and airway obstruction was a diagnosis in 18 patients (5.1 percent).

Table 1. Plastic Surgery Specimens Submitted for Pathologic Examination in 2015 at Two Tertiary-Care Hospitals

Specimen Type	No.	Findings
Nonbreast scar	67	0
Breast scar	19	0
Nonbreast skin	10	0
Breast skin	21	1*
Keloid	4	0
Implant	60	0
Expander	21	0
Capsule	30	0
Pannus	8	0
Cartilage	353	0
Rib	166	0
Total	759	1

*Seborrheic keratosis.

Table 2. Cost of Processing and Examination of Plastic Surgery Specimens

Specimen Type	No.	Findings	Cost
Nonbreast scar	67	0	$38,570.26
Breast scar	19	0	$9682.62
Nonbreast skin	10	0	$6433.40
Breast skin	21	1	$8490.29
Keloid	4	0	$3050.83
Implant	60	0	$13,981.87
Expander	21	0	$4350.45
Capsule	30	0	$13,669.92
Pannus	8	0	$4024.93
Cartilage	353	0	$223,625.23
Rib	166	0	$104,215.50
Total	759	1	$430,095.30

Gross only examination was performed of 161 specimens (21.2 percent). Of all 759 specimens submitted for pathologic analysis, there were no clinically significant findings (0.0 percent). There was a single clinically nonsignificant finding of a seborrheic keratosis on breast skin (0.13 percent).

The total amount billed for processing and pathologic examination of 759 specimens was $430,095. Of this, $366,118 (85 percent) was for pathologists' interpretation and $63,977 was for tissue processing. The total amount billed was $223,625 for cartilage, $104,216 for rib specimens, $63,177 for scars and skin, $18,332 for breast implants and expanders, and $20,745 for all other specimens (Table 2).

During the data collection period (2015), 88 percent of all breast implants and 12 percent of all tissue expanders removed were sent for pathologic examination. Of the breast implants and tissue expanders that were sent for pathologic examination, 93 percent were sent for gross examination only. The average amount billed for those specimens was $262, and the average amount billed for specimens not sent for gross examination only was $673.

The total amount collected was obtained for pathologic examination of specimens but not for tissue processing. The reimbursement rate for pathologists' examination was 26 percent of the amount billed and totaled $95,191.

DISCUSSION

Appropriate use of pathologic examination can result in significant savings in health care spending. Given the significant financial impact of sending routine specimens for pathologic examination, the need to submit these specimens must be justified. Although some hospitals require submission of all specimens for pathologic examination, the authors have found no evidence that routine submission of all surgical specimens is indicated. This is especially true of nonbiological specimens such as tissue expanders and breast implants, where sending for pathologic examination offers no clinically significant information that cannot be documented in the operative report.

In 2015, there were 77,218 tissue expanders placed (and subsequently removed) and 42,553 breast implants removed in the United States.[20] If throughout the United States these devices are sent for pathologic examination at the same rate as in our institution, their processing and interpretation may annually cost as much as $10.6 million. Considering that these two specimens accounted for only 4 percent of the cost of processing and examination of all specimens reviewed in this series, the overall national cost for routine processing of plastic surgery specimens may reach as high as $265 million annually.

There were also no significant findings found in our review of 353 submitted cartilage specimens and 166 rib specimens. Ribs are often removed solely to gain surgical access to vessels, and although some hospitals may not require submission of these specimens unless clinically indicated, some physicians still routinely submit them. Because there were no significant clinical findings in this study, the authors cannot justify routine submission of these specimens. Likewise, no pathologic findings were found in the 10 nonbreast skin, 67 nonbreast scar, and eight panni specimens that were sent. As such, routine submission of these specimens cannot be justified.

The authors also did not find any pathologic findings in their breast scar, breast skin, or breast capsule specimens. One would expect the yield to be low in finding any abnormality in these specimens. For example, the incidence of anaplastic large-cell lymphoma is estimated to be between one in 10,000 and one in 30,000 in breast capsules, and most of these would have positive clinical findings. Although we have no evidence that routine submission of these specimens is indicated, one may argue that for the potential risk of a significant finding, these should be submitted.

Overall, a clinically significant pathologic diagnosis was present in 0.0 percent of all specimens in this cohort. As such, the authors conclude that routinely sending low-risk specimens is not justified because of the high cost and low impact on patient care. To guide the decision of what to send for pathologic examination, we group specimens into three categories: may be excluded (relatively

Table 3. Recommendations for Use of Routine Pathologic Examination

May be excluded
Implant
Expander
Pannus
Send if there is a clinical suspicion
Skin
Scar
Cartilage
Rib
Keloid
Capsule
Always send
Skin (from breast with cancer history)
Scar (from breast with cancer history)

low risk), send if there is a clinical suspicion, and always send (relatively high risk) (Table 3). Specimens that may be excluded are nonbiological specimens that are explanted (i.e., breast implants). The largest category is "send if there is a clinical suspicion," because we believe that the surgeon is the best judge of what requires pathologic analysis and interpretation. Lastly, there are specimens that should likely always be sent for pathologic examination because of the relatively high incidence of findings that may affect patient care. Any specimens that contain breast tissue or that contain breast skin from a breast with a history of cancer should be evaluated to rule out malignancy.

One alternative to pathologic examination is sending specimens for gross examination only. This is often used to justify sending specimens that have no need for pathologic examination, and may be viewed as a way to decrease the cost associated with their processing. Indeed, our data support that gross examination is less expensive than pathologic examination, averaging $262 per specimen versus $673, respectively. These specimens may be sent to document and record information about explanted materials, both for surveillance and for documentation in the medical record. However, this information may be recorded by operating room staff and should be dictated into the operative report.

This study has several weaknesses. Policies and procedures vary by institution, as does culture, and this study reflects the practices at only two institutions. There are likely some institutions that do not routinely send plastic surgery specimens for pathologic examination; there are others where every specimen removed from a patient must be sent for pathologic examination. In the hospitals where these data were collected, no policy existed at the time of data collection regarding what must be sent for pathologic examination. As such, the decision was left to the surgeon and operating room staff. The authors hypothesize that with no policy to explicitly permit the exclusion of certain specimens from examination, many surgeons err on the side of submitting specimens.

Also, without knowing the base rate of positive findings in each of the specimen categories studied, it is possible that the lack of clinically significant findings is purely the result of chance. For this reason, any specimens that have the *potential* for a significant finding (human tissue) are grouped into the "always send" or "send if there is a clinical suspicion" category.

In addition, we were able to obtain actual amounts collected only for the professional interpretation portion of the cost of specimen processing and interpretation. As a result, the actual cost of specimen processing was estimated based on the reimbursement rate for professional interpretation. However, specimen processing accounted for only 15 percent of the total billed for all specimens; thus, underestimation or overestimation of the amount collected for this portion is unlikely to have a significant impact on overall cost.

Lastly, liberating surgeons from sending routine specimens for pathologic evaluation may increase the risk that a specimen that *should* be sent is inadvertently thrown out—a problem that is less likely to occur if specimens are always sent. As such, adopting these changes mandates close communication between surgeon and operating room staff, especially in complex, multiteam procedures.

CONCLUSIONS

A 1-year review of all plastic surgery specimens submitted for pathologic analysis at two large tertiary care medical centers demonstrates the infrequency of clinically significant results and the significant cost burden. These data do not support routine pathologic examination of all plastic surgery specimens. Instead, the authors justify select submission only when there is a clinical suspicion or medical history that warrants evaluation. By eliminating unnecessary histologic or macroscopic examination, significant cost savings may be obtained.

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