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ANNUAL REVIEW ISSUE

Does everything a surgeon takes out have to be seen by a pathologist? A review of the current pathology practice

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Abstract Histopathologic examination of surgically removed tissues and organs is an important aspect of modern hospital quality health care. Most surgical specimens deserve to be submitted for pathologic examination, which may yield valuable new information relevant for the future treatment of the patient. A small number of specimens, recognized as providing limited or no valuable clinical data during pathologic examination, may be placed on the list of specimens "exempt from submission" or those that are labeled as "for gross examination only." Guidelines written by the committees of the national regulatory organizations provide general orientation on how to deal with various specimens, but the final decision on which type of specimen to eliminate and which ones to include for pathologic examination rests on local governing and advisory bodies of each institution. Particular lists of specimens exempt from pathologic examination are best generated through a consensus agreement of clinical and laboratory physicians. Even though there is general nationwide and even international consensus on which types of specimens deserve pathologic examination and which do not, there are still discussions about the necessity of some pathologic examinations.

Keywords Pathology · Surgical specimen · Gross examination · Histopathologic evaluation · Exempt from submission

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Introduction

Advances in molecular biology and related disciplines are ushering a new era of pathology and yet microscopic examination of cells and tissues remains the gold standard of contemporary diagnostic pathology [1]. Histopathologic data provide critical guidance for treatment of most neoplastic conditions and many inflammatory diseases and are essential for planning the treatment or formulating the prognosis and predicting the clinical outcome. They also serve for quality control documentation and are routinely included in medical records for medical-legal purposes. Guidelines for specimen submission and handling in the pathology laboratories, as recommended by the College of American Pathologists (CAP), provide assurance that a standardized approach has been set in place in most if not all accredited laboratories in the USA [2]. Similar guidelines exist in other parts of the world indicating that evidence-based medicine requires a regimented and uniform approach to tissue diagnosis and is a prerequisite for universally acceptable synoptic reporting of pathology findings [3].

In the USA, routine pathologic examination of surgical specimens has been recommended in 1926 by MacEachern [4] who included it in the *Minimum standards for hospitals*, prepared on behalf of the American College of Surgeons. In this document, it was proposed "that all tissues removed at operation shall be examined in the laboratory and reports rendered thereon." Over 70 years later, a slightly modified recommendation is still included in the Manual of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), which states that "specimens removed during surgery need to be evaluated for gross and microscopic abnormalities before a final diagnosis can be made" [5]. Although there are no arguments about the gross examination of the specimen by the surgeon or the pathologist, or preferably by both, the question arose about the value of mandatory

examination of all tissues removed during surgery. Papers advocating a more selective approach to specimens like gallbladder, hernia sacs, and appendices started to appear [6]. The ever increasing cost of processing tissues, preparation of slides, and generation of written pathology reports led to studies about the cost benefit ratio for certain types of pathologic examinations [7]. Inadequate staffing of pathology departments in some countries, combined with the low clinical value of certain pathologic examinations have stimulated an ongoing discussion about the need for universal or mandatory examination of all tissue specimens removed at surgery as summarized by Matthyssens et al. [8].

The discussion about the need for nonselective and indiscriminate or pathologic examination of tissue stimulated quite a number of studies and led to the formulation of consensus documents designed to provide rational, evidence-based guidance for daily practice of pathology. Most notable among these are the one prepared in two iterations by The Royal College of Pathologists (RCP) dealing explicitly with specimens of "limited or no clinical value" [9] or the Q-Probe prepared for the CAP dealing with specimens "for gross examination only" [10]. The most systematic study conducted by Zarbo and Nakhleh [11] based on the survey of 413 institutions provides a framework for all other efforts to standardize current practices of submission of specimens for pathologic examination and those that are considered to be exempt from such examinations. Still it is worth mentioning that even in the USA, there are no generally accepted standards for what tissues or specimens do not need to be submitted for histopathologic examination [12].

In recent decades, diagnostic histopathology has been significantly improved through the guidelines, standards, and recommendations issued by the appropriate regulatory bodies or health committees. The strong leaderships of the CAP in the US and the RCP in the UK have provided solid foundation for best possible practice. Reading those documents one cannot but be impressed with the extent of consensus on two sides of the Atlantic, especially when dealing with specimens that may be exempt from submission, and those requiring gross examination only. Yet both of these normative documents are in essence legally non-binding. Furthermore, both documents recommend that the true list of exempt specimens be drawn locally in hospital committees comprising pathologists, surgeons, and other clinicians. Most if not all US health care institutions have developed such policy statements together with lists of specimens that need not to be submitted for pathologic examination and those that are for gross examination only.

A fairly representative list from the Massachusetts General Hospital [12] comprises 10 items in the "need not be submitted" category and 12 items in the "gross-only." This is comparable with the findings of Zarbo and Nakhleh [11], who reviewed the practice in over 400 institutions and found that in more than 50 % of institutions only 8 types of specimen were listed as exempt from examination and 28 types of specimens were listed for gross examination only. Representative items from that study are presented in Table 1. Consensus about the best practice prevails, but there are still quite a few recent papers exploring the arguments for and against extensive submission of "low yield" and "low risk" specimens for pathologic examination.

Surgical procedures of appendix, gallbladder, hemorrhoids, and inguinal hernia constitute up to 25 % of all surgical specimens in daily general and abdominal surgery [8]. We have reviewed some of the literature pertaining to these specimens, and here, we will briefly use those data to illustrate the ongoing discussion about the submission of specimens for pathologic examination. We will also touch upon the problem of the examination of placentas, to illustrate how this important issue has not been resolved yet, despite its medical and medical-legal significance.

Gallbladder

Cholecystectomy is among the most common surgical procedures, in most instances performed for recurrent signs and symptoms of cholecystolithiasis. The clinical value of routine submission of gallbladder to pathology laboratory is at least questionable, except in cases where some grossly visible abnormality has been recognized by the surgeon. Although both CAP and RCP recognized the limited value of routine histopathologic evaluation of gallbladder, their recommendations did not include gallbladder as a specimen classified as "exempt from histopathologic evaluation" [9]. However, a recent systematic review of Swank et al. (based on 30 studies covering more than 60,000 cholecystectomy specimens) did not support routine histopathologic evaluation of gallbladder specimens in clinical practice due to the overall low prevalence of adenocarcinoma (~0.4 %) among the Western population, while a significantly higher prevalence (1.2 %) of gallbladder adenocarcinoma was found among the Asian population [13]. Of note, in both populations gallbladder carcinoma was expected either pre- or intraoperatively in approximately 50 % of the cases (range, 45–65 %). Indeed, macroscopic examination of the gallbladder specimens may help detecting adenocarcinomas in the majority of the cases [14]. Hence, a more selective approach might be justified. In this context, one should mention the studies of Elshaer et al. [15] and Lohsiriwat et al. [16] who recommended patients' age as an additional factor for a selecting specimens for histopathologic evaluation of gallbladder specimens following cholecystectomy. A formal consensus would be welcome by pathologists and surgeons to avoid confusion or uncertainty or even potential legal consequences of a decision to classify gallbladders as "exempt from pathologic examination."

Table 1 Overview of the specimens that are either subjects of exempt from submission or submitted for gross examination only in the majority of US institutions; survey covered 413 institutions across the USA, Canada, Australia, and UK (adapted from ref. [11])

Specimen name	Exempt from submission (>50 % of institutions)	Gross examination only (>50 % of institutions)
Calculi (renal/ureteral, bladder)	No	Yes
Foreign bodies (including vaginal)	No	Yes
Mammary, tissue expander and penile implants	No	Yes
Medical devices	No	Yes
Therapeutic radioactive sources	Yes	No
Toenails and fingernails	No	Yes
Intrauterine contraceptive devices	No	Yes
Placentas (normal and uncomplicated pregnancy)	Yes	Yes
Lens cataracts	Yes	Yes
Hardware (including orthopedic)	Yes	Yes
Dental appliances	No	Yes
Teeth	Yes	Yes
Cartilage/bone during "plasty" surgery	No	Yes
Middle ear tubes and other otologic appliances	No	Yes
Foreskin (circumcision)	Yes	No
Artificial heart valves	No	Yes
Intravascular catheters	No	Yes
Pacemaker devices	No	Yes

Appendix

Acute appendicitis is the most common general surgical procedure [17]. It is estimated that approximately 7 % of individuals in Western countries undergo appendectomy [18]. Appendices removed during appendectomy are routinely submitted for histopathologic examination, most likely because of historically established "reflex" handling of surgical specimens. One could also argue that the histopathologic examination of the appendices provides some quality control and could also reduce the number of unnecessary appendectomies or provide useful clinical data that could be then correlated with the clinical presentation of the disease. CAP and RCP did not exclude appendix from the routine histopathologic examination although RCP recommendations indicated a potentially limited value of its routine evaluation. Swank et al. conducted a systematic review on the necessity of routine histologic analysis of appendectomy specimens. Their systematic review revealed a low incidence of unexpected findings (e.g., carcinoma in 0.2 %; benign tumors in 0.5 %) in appendectomy specimens. The authors also evaluated the role of intraoperative examination of appendix to detect a significant pathology. They found it to be insufficient for identifying unexpected disease. However, they found that the benefits of histopathologic evaluation of appendix are not studied adequately and therefore authors recommended a routine evaluation of all appendectomy specimens so far. Until such studies are published in peer-reviewed journal, we predict that appendectomy specimens will be routinely sent for histopathologic examination.

Hernia sac

Although the repair of inguinal and abdominal wall hernias (e.g., umbilical and ventral hernia) is a common surgical procedure, hernia sacs are rarely evaluated in histopathologic labs [19]. A survey of Zarbo et al. included 413 institutions enrolled in a quality improvement program for the CAP, of which 28 institutions had policies that exempted inguinal hernia sac specimens from evaluation whereas pathologists from 98 institutions performed only gross examination [20]. A recent study of Chesley et al. on 1216 hernia specimens revealed a rarity of pathologic alterations in submitted hernia sacs and confirmed a relatively infrequent submission (~20 %) of hernia sacs to histopathologic examination [21]. Even when the pathologic findings are present, they have no significant clinical impact in most instances [22]. Similar results were obtained on pediatric hernia sac specimens according to several studies [23-25]. It seems that hernia sacs could be safely classified as specimens exempt from pathologic examination or labeled "for gross examination only."

Placenta

There is a general agreement that all placentas must be examined by the obstetricians, who will then decide whether or not to send the placenta for pathologic examination. In 1989, CAP has appointed a Placental Pathology Practice Guideline Development Task Force, which studies the problem for some time and 8 years later published practice guidelines for

examination of placenta [26]. The indication for placental examination listed in that guideline paper can be divided into three groups:

a) *Maternal indications* such a premature delivery (less than 34 weeks of gestation), severe oligohydramnios, maternal fever, concern for maternal infection during pregnancy
b) *Fetal/neonatal indications* such as stillbirth, low birth weight (<10th percentile), *hydrops fetalis*, fetal infection, congenital anomalies, multiple gestations
c) *Placental indications* such as physical abnormalities, small or large placenta, umbilical cord lesions, marginal or velamentous cord insertion

Even though the indications for placental examination are clearly defined, the number of placental examinations is much lower than one would expect. In most US medical centers, 70 % of all pathology departments have examined 25 % or fewer placentas delivered at their institutions [27]. The reasons for such a low compliance with CAP recommendations is not known [28]. It is worth a notice that most practicing obstetricians do not even know that there are CAP guidelines and are thus unaware how much the pathologic examination of the placenta could help them clinically and in many instances in legal sense as well [29]. Of all the specimens included in this review, placental histopathologic examination seems to be the most blatant example of underutilization of pathology services by the clinicians. A better communication between the obstetricians and pathologists may correct this anomalous situation.

Hemorrhoids

Hemorrhoidectomy is a frequent surgical procedure for which a selective rather than routine pathological examination has been proposed [8, 30]. The main concern regarding hemorrhoidectomy is related to the detection of unsuspected anal carcinoma. A study of Matthyssens et al. highlighted an exceptionally low incidence of anal carcinoma, particularly in the absence of grossly identified pathologic alterations [8]. These observations have also been supported by other researchers [31]. Hemorrhoids represent low yield specimens and could easily be left unexamined, unless there is a valid clinical justification for histopathologic examination. Recent changes in the treatment of hemorrhoids, with an ever increasing number of "banding procedures," which are replacing surgical resection, have already reduced the overall number of hemorrhoidectomy specimens in most hospitals. As these new techniques advance, one can expect that the entire issue about the submission of surgically removed hemorrhoids will thus become mute.

Conclusions and perspectives

In this short overview which began with a question, we have touched upon some of the problems pertaining to the handling of surgical specimens. Instead of one question and a single tentative answer, we will end this paper with several additional questions and suggested answers which we hope could serve not only as a food for thoughts but also topics for future discussions.

– *Does everything a surgeon takes out have to be seen by a pathologist?* Obviously not. Most surgically resected tissues will end up in the pathology department, and most of them will be examined pathologically. A small number of specimens will be submitted for gross examination only, and another small contingent will be exempt from submission to the pathology department. A typical algorithm for handling surgically resected specimens is presented in Fig. 1.
– *Who writes the rules on how to handle surgical specimens?* If you volunteer you might get to write them yourself in a committee that will include both clinical and laboratory physicians. National organizations issue guidelines may send inspectors to see if these guidelines are enforced, but the main responsibility for formulating the local rules rests on staff physicians of each health care providing institution. The guideline actually explicitly state that the institutional rules and regulations pertaining to

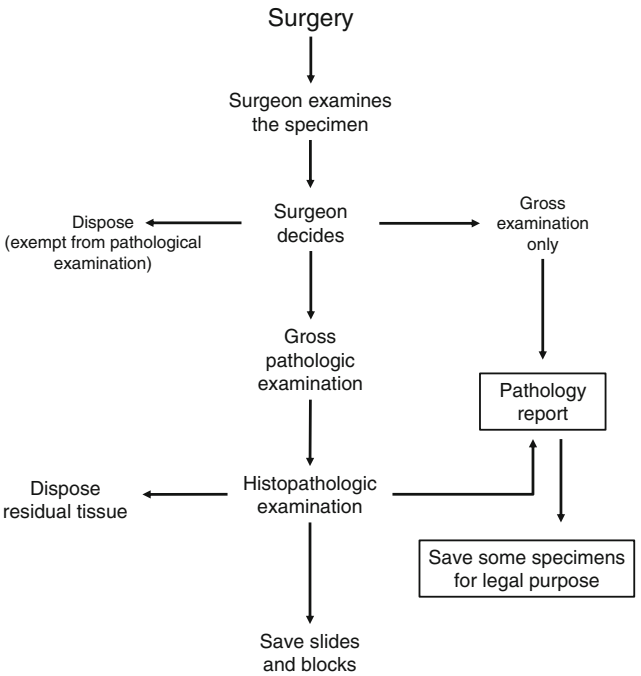

Fig. 1 A flow chart showing an algorithm how to handle with surgical specimens that are potentially amenable for either an exempt from histopathologic evaluation or gross examination only

specimen handling must be developed in a committee and by consensus of local physicians. These rules and regulations must be revisited every few years to make sure that they still meet the needs of the local medical community.

– *Who decides on labeling the specimen as "exempt" or "gross only"?* In principle it is the surgeon who decides. However, if you have any doubts, consult the rules and regulations of your institution, which are in most instances readily found on line. You might be surprised how detailed the instructions on handling the surgical specimens are! However, if you discover that your institution does not have such rules and regulations, you should alert your colleagues that "something important is missing" and that some action might be in order. Most if not all major JCAHO accredited hospitals have such rules and regulations. How is the situation in Europe or in other parts of the world we do not know, but it might be a worthwhile project for a multinational committee dealing with hospital accreditations and standards.
– *Are the rules governing the handling of surgical specimens immutable*? They are definitely not written for eternity and the history shows that they constantly changing with times. Thus, we can expect that these rules will change, reflecting our needs and the medical and legal requirements that are governing such practices.
– *Is there a final conclusion for our readers*? Play by the rules, but do not forget common sense.

Conflict of interest

The authors declare that they have no competing interests.

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