

TIME CONSUMING AND DECISION MAKING PROCESS IN FROZEN SECTION SURGICAL PATHOLOGY SERVICE

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SUMMARY – Frozen section (intraoperative biopsy) is one of the most important and most difficult procedures that a pathologist performs during his/her practice. It is performed daily at most pathology departments and requires experience, the capacity to make quick decisions under pressure, the knowledge of clinical medicine, and awareness of the limitations of the method. The aim of the study was to determine the number of frozen sections according to surgical departments and diagnoses at Surgical Pathology Division of the Ljudevit Jurak University Department of Pathology, Sestre milosrdnice University Hospital in Zagreb, during the 1998-2004 period. Data were retrieved from the Thanatos program for data archiving, analyzed and divided according to departments (ENT, general surgery, neurosurgery, urology, gynecology, and others) and diagnoses (benign tumor, malignant tumor, other conditions and description). During the 1998-2004 period, the relative frequency of frozen sections rose steadily from 6.25% in 1998 to 7.78% in 2004 ($p < 0.001$). A statistically significant increase was noticed in the number of intraoperative biopsies from the departments of neurosurgery ($p < 0.001$), urology ($p < 0.001$), gynecology ($p < 0.01$) and other departments ($p < 0.001$), while the number of intraoperative biopsies from the surgical department decreased significantly ($p < 0.001$). The difference in the number of intraoperative biopsies from ENT department was not significant. The diagnosis of benign tumors was significantly more frequent in 1998 than in 2004 ($p < 0.05$), and so was the diagnosis of metastases ($p < 0.001$). The number of descriptive answers was significantly higher in 2004 ($p < 0.001$), but the difference in the number of diagnosed malignant tumors and other conditions was not significant. The number of samples examined on frozen section ranged from 1 to 14, the mean number of samples being 1.2 to 1.8. The number of routine, paraffin embedded biopsies that rose through the analyzed period was followed by the increased number of frozen sections. The significant increase in the relative frequency of descriptive diagnoses could mainly be attributed to the intraoperative examination of lymph nodes that proved to be free from tumor.

Key words: *Frozen section; Surgical pathology*

Introduction

The procedure colloquially known as frozen section is one of the most important and most difficult procedures that a pathologist performs during his/her practice¹. It requires experience, the knowledge of clinical medicine and pathology, the capacity to make quick decisions under pressure, an attitude that is moderately conservative, and awareness of the limitations of the method². While in 1959,

Dr Lauren Ackerman wrote that «there is only one purpose in the frozen section and that is to make a therapeutic decision»³, in the last 60 years the situation has changed. The introduction of surgical staging procedures and special studies requiring fresh tissue material has given new meanings to the frozen section⁴. Although, the most common reasons for intraoperative consultations or frozen sections vary according to organ system, in the current practice of surgical pathology they are the following (in the order of relative frequency): 1) the need of an immediate diagnosis when no previous tissue diagnosis is available; 2) determination of the disease spreading extent locally and beyond the local resection field; 3) assessment of an un-

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suspected finding at the time of operation; 4) determination of resection margins of known malignant processes; 5) determination of the diagnosis adequacy of the tissue remove; and 6) the need to obtain fresh tissue for special studies^{1,5,6}. Frozen section should never be undertaken in cases: 1) of mere curiosity on the part of the clinician or the patient's family members; 2) when the lesion is architecturally fragile, or if the material is very scarce, so that the morphologic attributes might be irreparably damaged by frozen section artifact; and 3) when the specimen consists of a large mass and the necessarily limited sampling at the time of frozen section might lead to a high degree of error^{1,4}. The main question that a surgeon should ask himself when deciding whether or not to perform frozen section is: will the result of the frozen section examination influence the surgical procedure in any way? If the answer is negative, the procedure is not indicated⁷. In their study, Dehner and Rosai concluded that, using this simple criterion, almost half of the frozen sections done at a particular institution could have been avoided⁸. The aim of this study was to determine the number of frozen sections according to surgical departments and diagnoses, at the Surgical Pathology Division of the Ljudevit Jurak University Department of Pathology, Sestre milosrdnice University Hospital in Zagreb, during the 1998-2004 period.

Methods

Data were retrieved from the Thanatos program for data archiving, analyzed and divided according to departments (ENT, general surgery, neurosurgery, urology, gynecology and others) and diagnoses (benign tumor, malignant tumor, other conditions and description).

On statistical analysis χ^2 -test was used (Analyze-it for Excel for Windows, Analyze-it Software Ltd., version 1.71).

Results

During the 1998-2004 period, the number of biopsies in general as well as the number of frozen sections rose steadily. In 1998, 13 213 biopsies were analyzed at the Department, whilst this number increased to 17 064 in 2004. In 1998, the number of frozen sections was 826, and in 2004 it increased to 1328. The relative frequency of frozen sec-

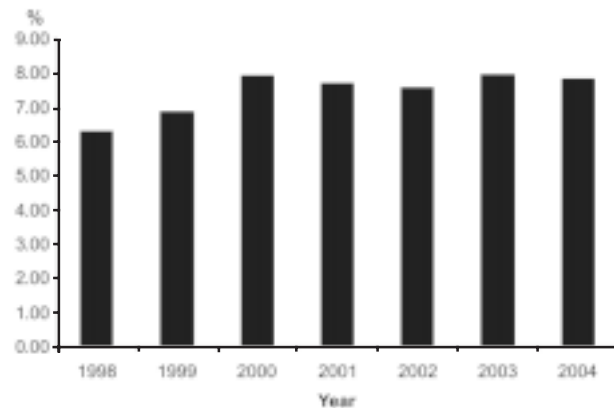


Fig. 1. Relative frequency of frozen sections at Ljudevit Jurak University Department of Pathology during the 1998-2004 period.

tions increased from 6.25% in 1998 to 7.78% in 2004 ($p < 0.001$) (Fig. 1). A statistically significant increase was noticed in the number of intraoperative biopsies from the departments of neurosurgery ($p < 0.001$), urology ($p < 0.001$), gynecology ($p < 0.01$) and other departments ($p < 0.001$), while the number of intraoperative biopsies from the surgical department decreased significantly ($p < 0.001$). The difference in the number of intraoperative biopsies from ENT department was not significant (Fig. 2). The relative frequency of intraoperative consultations according to the total number of biopsies from the surgical departments during the study period showed a significant increase for the departments of ENT ($p < 0.01$), urology ($p < 0.001$), gynecology ($p < 0.01$) and others ($p < 0.01$). The relative frequency of intraoperative biopsies from the department of neurosurgery according to the total number of biopsies

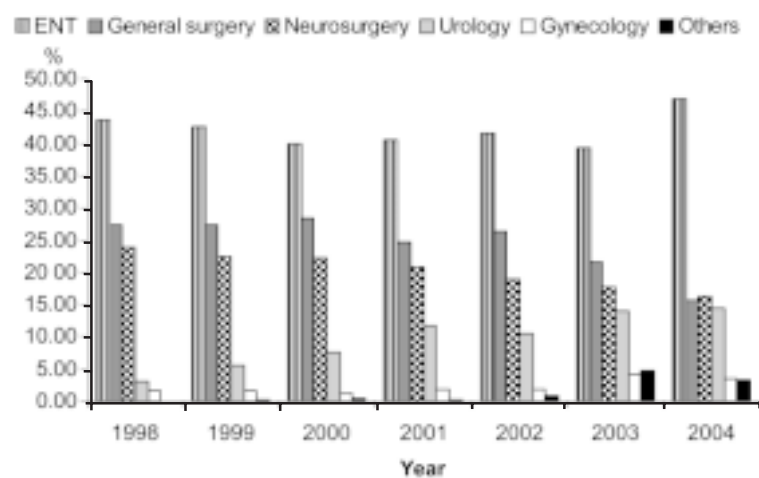


Fig. 2. Relative frequency of frozen sections at Ljudevit Jurak University Department of Pathology during the 1998-2004 period according to departments.

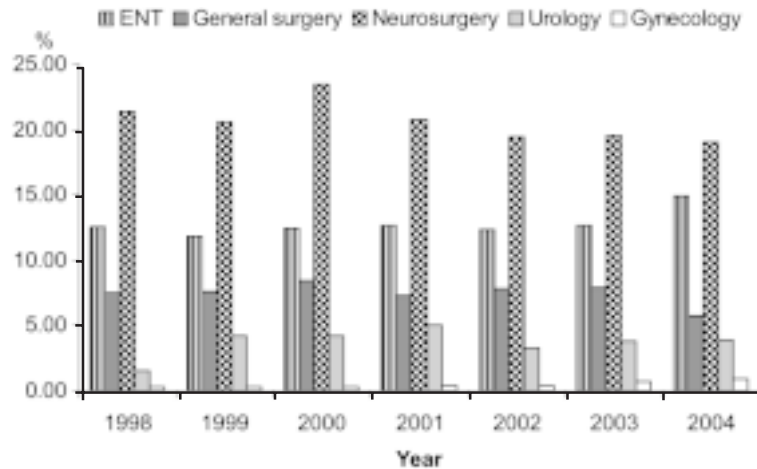


Figure 3. Relative frequency of frozen sections at Ljudevit Jurak University Department of Pathology during 1998-2004 period according to total number of biopsies from clinical departments.

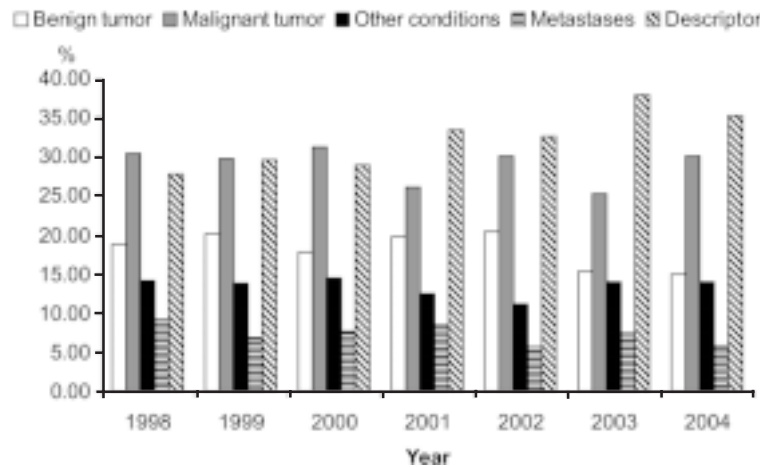


Fig. 4. Relative frequency of frozen sections at Ljudevit Jurak University Department of Pathology during the 1998-2004 period according to intraoperative diagnosis.

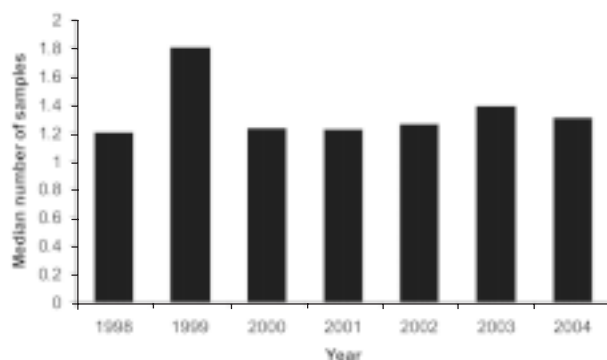


Fig. 5. Median number of specimens referred for frozen section to Ljudevit Jurak University Department of Pathology during the 1998-2004 period.

from that department was not significant, and the number of intraoperative biopsies according to total number of biopsies from the department of general surgery decreased significantly ($p < 0.01$) (Fig. 3). The diagnosis of benign tumors was significantly more frequent in 1998 than in 2004 ($p < 0.05$), and so was the diagnosis of metastases ($p < 0.001$). The number of descriptive answers was significantly higher in 2004 ($p < 0.001$), but the difference in the number of diagnosed malignant tumors and other conditions was not significant (Fig 4). The number of samples examined on frozen section ranged from 1 to 14, and the median of samples varied from 1.2 to 1.8 (Fig. 5). The median time required for intraoperative analysis was 27.5 (range 20-35) minutes.

Discussion

The results of this study disclosed a fact that the increase in the absolute number of routine, paraffin embedded biopsies was followed by an increase in intraoperative consultations. For most of the analyzed departments this increase was significant, except for the department of general surgery, where it decreased significantly. As to the number of intraoperative consultations according to the total number of biopsies from the analyzed departments, the relative frequency of frozen sections also increased for most of them, or at least showed no significant decrease, except for the department of general surgery. The most interesting result is the one showing a significant increase in descriptive diagnoses on frozen sections. One (but not the only) reason for this result could be the fact that the number of lymph node frozen sections from most departments has been constantly increasing, either in cases of radical prostatectomy, sentinel lymph nodes in cases of melanoma, or in other circumstances. If the lymph node is free from tumor, the diagnosis is descriptive. Although the number of frozen sections from the gynecology department remained relatively low, many of the samples were (negative) curettage specimens in suspected cases of ectopic

pregnancy that also carried a descriptive diagnosis. Also, in many cases of frozen sections from ENT department that analyzed surgical margins that were tumor free, the diagnosis is a descriptive one. However, sometimes the pathologist cannot reach the decision on the basis of frozen section, so that the diagnosis can only be descriptive. Sometimes, the tissue removed is representative of the lesion but the definitive diagnosis has to wait for permanent section. If this is the case, the surgeon has to decide, depending on the nature of the case, whether to give the pathologist additional tissue for frozen section or to close the incision and wait for permanent section. The limitations of frozen section can be divided into true limitations and the avoidable ones⁹. Some consider true limitations to be the time, limited special stains and studies that cannot be performed on a frozen section the lack of consultation, and freezing artifacts. The avoidable artifacts are: drying artifacts, sampling error, fat, inferior quality of the section, inconsistency of training and performance, and the method of tissue embedding⁹. Even though the instrument used for preparation of frozen sections, the cryostat, has gone through many improvements over time, the appearance of artifacts is sometimes unavoidable¹⁰. However, the overall accuracy of frozen section procedure has been tested and proved on numerous occasions, in both university and community hospitals¹¹. The College of American Pathologists (CAP) sponsored a review of over 90 000 frozen sections performed at 461 institutions that showed a concordance rate of 98.58% with definitive diagnosis at paraffin embedded material; 67.8% of discordant cases were false negative diagnoses for neoplasm. The main reasons for the discrepancies were misinterpretation of the original frozen section, absence of diagnostic tissue in the frozen material but its presence in the material not sampled, and absence of diagnostic tissue in the frozen section but its presence in the corresponding permanent section¹². Even though the possibility of a pathologist's error can never be completely excluded, it can be minimized in a way that the responsibility for frozen section analysis should fall on a well trained pathologist whose main activity is in the division of surgical pathology and who knows well the surgeon requesting the procedure². As to the other two reasons, it is sometimes impossible to analyze intraoperatively, for example, all of the ovarian tumor of great proportions. Proliferative mucinous ovarian tumors are especially difficult to sample adequately, because they often contain small foci of invasive carcinoma that are easily missed on frozen section sampling¹³. The situation is very similar in cases of lymph node submission for intraoperative consultation during radical pros-

tatectomy, because there may be too many of them. In such cases, the most suspect ones are chosen for frozen section, because otherwise the surgical procedure would be prolonged. Deeper sections of the same blocks, or lymph nodes that did not seem suspect during intraoperative gross analysis, however, may reveal micrometastases on permanent sections¹⁴. One also has to bear in mind that the aforementioned cryostat is an expensive device, so that the cost factor, together with the space required for operation of the machines, makes it generally impractical for most hospitals to have several of them in operation at the same time and in the same place. Therefore, if several specimens are received in the laboratory simultaneously, a significant period of time may elapse before all of them can be sectioned properly on the available cryostat(s). Such considerations, together with the cost of «dead time» in the operating room, account for the escalating costs of frozen sections in modern hospital practice¹⁰. This fact is, besides the interest of the patient, the reason that the frozen section has to be quick. Although the data from the literature differ, a CAP sponsored study of almost 33 000 frozen sections done in 700 hospitals from different countries showed that 90% of the procedures were completed within 20 minutes, measured from the time that the pathologist received the specimen to the time that he returned the frozen section diagnosis to the surgeon^{9, 10, 15}. In this study, the average time for completing the frozen section analysis did not fall behind, especially bearing in mind the fact that our Department is dislocated from the main operating theaters. However, the accuracy of frozen sections analyzed in this study was not assessed, so it remains to be done in a future investigation.

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Sažetak

INTRAOPERACIJSKA BIOPSIJA: ZAHTJEVAN DIJAGNOSTIČKI POSTUPAK NA ODJELU ZA KIRURŠKU PATOLOGIJU

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Intraoperacijska biosija je jedan od najvažnijih i najtežih dijagnostičkih postupaka koje patolozi poduzimaju tijekom svog rada. Na većini odjela za patologiju ona se izvodi svakodnevno. Cilj rada bio je utvrditi broj intraoperacijskih biopsija i na njima postavljenih dijagnoza na Kliničkom zavodu za patologiju «Ljudevit Jurak», Kliničke bolnice «Sestre milosrdnice» u Zagrebu, tijekom razdoblja od 1998. do 2004. godine. Za analizu podataka uporabljen je program za pohranjivanje i obradu podataka iz patologije «Thanatos». Podaci su podijeljeni s obzirom na kirurški odjel (ORL, opća kirurgija, neurokirurgija, urologija, ginekologija i ostali) te s obzirom na postavljenu dijagnozu (dobročudni tumor, zloćudni tumor, ostala stanja, metastaze i opis). Tijekom razdoblja od 1998. do 2004. broj intraoperacijskih biopsija se neprekidno povećavao, s relativnom učestalošću od 6,25% u 1998. do 7,78% u 2004. godini ($p < 0,001$). Značajan porast broja intraoperacijskih biopsija je opažen s neurokirurgije ($p < 0,001$), urologije ($p < 0,001$), ginekologije ($p < 0,01$) te ostalih odjela ($p < 0,001$), dok se broj intraoperacijskih biopsija s odjela opće kirurgije značajno smanjio ($p < 0,001$). Razlika u broju intraoperacijskih biopsija s odjela ORL između 1998. i 2004. godine nije bila značajna. Dijagnoza dobroćudnog tumora postavljena je 1998. značajno češće nego 2004. ($p < 0,05$), kao i dijagnoza metastaza ($p < 0,001$). Broj opisnih dijagnoza u 2004. je bio značajno veći, no razlika između broja dijagnoza zloćudnog tumora i ostalih stanja nije bila značajna. Broj rutinskih biopsija u proučavanom razdoblju bio je praćen povećanim brojem intraoperacijskih biopsija.

Ključne riječi: *Intraoperacijska biopsija, Kirurška patologija*