Diagnostic Accuracy of Frozen Section in Various Thyroid Disorders as Compared with Paraffin Section from the Same Cases

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Abstrak

Penelitian ini adalah penelitian retrospektif yang menggunakan data dari Sub Unit Patologi Anatomi, Instalasi Bedah Sentral, RS Dr. Cipto Mangunkusumo, mulai Januari 1990 sampai Desember 1991. Selama dua tahun dilakukan 207 kasus potong beku jaringan tiroid. Dari 185 kasus yang diteliti,ditemukan 157 kasus (84,9%) kelainan jinak dan 28 kasus (15,1%) ganas. Pada sediaan parafin ditemukan 158 kasus (85,4%) jinak dan 27 (14,8%) ganas. Terdapat positif palsu 3 kasus dan negatif palsu 2 kasus. Sensitivitas mencapai 92,6%, spesifisitas 98,1%, ketepatan keseluruhan 97,3%, nilai ramalan positif 89,3% dan nilai ramalan negatif 98,7%. Dengan analisis tersebut disimpulkan bahwa ketepatan diagnosis potong beku jaringan tiroid cukup tinggi, sehingga cara ini masih diperlukan dalam menentukan keganasan tiroid dengan cepat.

Abstract

This is a retrospective study using the data from the Anatomic Pathology Sub Unit of the Central Surgery Instalation of the Dr. Cipto Mangunkusumo Hospital, from Januari 1990 to December 1991. During a two-year period there were 207 cases of thyroid frozen sections. A number of 185 cases have been reviewed, 157 (84.9%) were benign and 28 (15.1%) were malignant. In paraffin sections 158 cases (85.4%) were benign and 27 cases (14.6%) were malignant. There were 3 false positive and 2 false negative cases. The sensitivity was 92.6%, specificity 98.1% and the accuracy 97.3%. The positive predictive value was 89.3% and the negative predictive value 98.7%. From the analysis we conclude that there is high accuracy in frozen section diagnosis of the thyroid nodules. This method is still necessary to decide rapidly any thyroid malignancy.

Keywords: *accuracy, thyroid frozen section.*

INTRODUCTION

The major reason for performing frozen section is to obtain a diagnosis of a pathologic process, chiefly to determine quickly whether it is malignant or benign. Another reason is to determine the presence or absence of tumor metastasis in lymph nodes. Frozen section is also done for tissue identification and for determination of the adequacy of resection margins of a malignant lesion. In other words, frozen section will help the surgeon to determine the treatment. Since diagnosis is made by the pathologist, the result of the frozen section will have serious consequences in the treatment of the patient. So, the accuracy of this method has to be evaluated.

In general, frozen section has a high degree of accuracy.[1-5] For thyroid tissue, the accuracy is claimed to be about 87% to nearly 98%.[6-10] We hope that a surgeon can determine and take the right tissue samples. No pathologist can overcome the handicap of choosing the inaccurate tissue. Consequently, both the surgeon and the pathologist need to understand each other to give maximum services.[1,6,11] The use of this technique is limited and the evaluation is more difficult than the paraffin slides. Especially for thyroid frozen section, prerequisites are needed in order to get a high accuracy diagnosis. The most common difficulty in frozen section is in determining the malignancy on follicular lesions. We ussually get difficulties in diagnosing the nodule. So, if we find a follicular lesion and we don't find vascular or capsular invasion, we must delay the diagnosis, till the paraffin slide in process is ready to use.

The aim of this retrospective study is to know the accuracy of frozen section diagnosis in some thyroid-

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disorders compared with paraffin section from the same cases.

MATERIALS AND METHODS

The material was obtained from the Anatomic Pathology Sub Unit of the Central Surgery Instalation of the Cipto Mangunkusumo Hospital from January 1990 to Desember 1991. All their clinical data and paraffin sections were examined. We found a number of 207 cases of thyroid frozen sections within the period and 185 of which were included in this research. The remainder were not included in this research because the slides were lost (4 cases) and the rest were cases with follicular lesions (18 cases).

Efficacy

To evaluate the accuracy of frozen section diagnosis we need to know the efficacy of this method. Therefore we made binomial random numbers to simulate the 2 x 2 table as shown in Fig 1. Efficacy is the proporsion of malignancy coinciding with paraffin diagnosis as a gold standard. Comparison between this method and the gold standard produces 4 possibilities, those are: true positive (a), false positive (b), true negative d) and false negative (c).

a	b	a+b
c	d	c+d
a+c	b+d	a+b+c+d

Fig 1. The 2 x 2 table

Sensitivity

Sensitivity is the probability that the malignant tumor can be diagnosed on the patients proved to bear a malignant tumor.

$$\text{Sensitivity} = \frac{\text{true positive}}{\text{true positive + false negative}}$$

Specificity

Specificity is the probability that a benign lesion can be diagnosed on patients having no malignant tumor.

$$\text{Specificity} = \frac{\text{true negative}}{\text{true negative + false positive}}$$

Accuracy

Accuracy is the combination of sensitivity and specificity.

$$\text{Accuracy} = \frac{\text{true positive + true negative}}{\text{true pos. + false pos. + true neg. + false neg.}}$$

Positive and negative predictive value

Positive predictive value of a test is the probability that a patient has a malignant tumor if the test is positive for malignant tumor.

$$\text{Positive predictive value} = \frac{\text{true positive}}{\text{true positive + false positive}}$$

Negative predictive value of a test is the probability that a patient has no malignant tumor if the test is negative.

$$\text{Negative predictive value} = \frac{\text{true negative}}{\text{true negative + false negative}}$$

RESULTS

From the 185 cases studied we found 157 (84.9%) and 28 (15.1%) cases with benign and malignant lesions respectively, at frozen section. Benign lesions cover adenomatous goiter, Basedow's disease, chronic thyroiditis and thyroglossal cyst (see Table 1), while malignant lesions consist of papillary carcinoma, follicular carcinoma, anaplastic carcinoma and unidentified carcinoma (see Table 2).

Table 1. Benign lesions at frozen section

Type of lesion	number of cases	%
Adenomatous goiter	153	97.5
Basedow's disease	2	1.3
Chronic thyroiditis	1	0.6
Thyroglossal cyst	1	0.6
Total	157	100

Table 2. Malignant lesions at frozen section

Type of lesion	number of cases	%
Papillary carcinoma	16	57.1
Follicular carcinoma	5	17.9
Anaplastic carcinoma	3	10.7
Carcinoma	4	14.3
Total	28	100

From paraffin sections there were 158 benign and 27 malignant lesion cases. Benign lesions cover adenomatous goiter, follicular adenoma, Hurthle cell adenoma, Basedow's disease, chronic thyroiditis and thyroglossal cyst (Table 3). Malignant lesions cover papillary carcinoma, follicular carcinoma, anaplastic carcinoma, Hurthle cell carcinoma and squamous cell carcinoma (see Table 4).

Table 3. Benign lesions at paraffin section

Type of lesion	number of cases	%
Adenomatous goiter	150	94.9
Follicular adenoma	2	1.3
Hurthle cell adenoma	2	1.3
Basedow's disease	2	1.3
Chronic thyroiditis	1	0.6
Thyroglossal cyst	1	0.6
Total	158	100

Table 4. Malignant lesions at paraffin section

Type of lesion	number of cases	%
Papillary carcinoma	19	70.4
Follicular carcinoma	5	18.5
Anaplastic carcinoma	1	3.7
Hurthle cell carcinoma	1	3.7
Squamous cell carcinoma	1	3.7
Total	27	100

Table 5. Diagnostic errors

Frozen section		Paraffin (Gold Standard)	
Papillary carcinoma	1*	adenomatous goiter	1
Carcinoma	2*	adenomatous goiter	1
		Hurthle cell adenoma	1
Adenomatous goiter	2**	Papillary carcinoma	2

* false positive (3)
** false negative (2)

From the above data we found three false positive and two false negative cases (see Table 5). After being analysed we found that the sensitivity was 92.6%, specificity 98.1%, accuracy 97.3%, positive predictive value 89.3% and negative predictive value 98.7%.

DISCUSSION

Thyroid frozen section needs choosing the sample in detail, both by surgeon and pathologist. The wrong sample makes false negative.[6]

Macroscopic examination is necessary. At macroscopic examination we are usually able to make an estimation of the diagnosis. For the exact diagnosis, we need histopathological examination. To increase the accuracy of frozen section needs other examinations, for example, fine needle aspiration and imprint cytology. Aspiration and imprint cytology's cells can be observed clearly by both cytologic examinations. It is said that imprint cytology can help to increase the accuracy of frozen section diagnosis.[2,12,13.14,15]

In this observation we get 97.3% of accuracy. There are some different results from other observations, ranging from 87 to nearly 98%.

The most common benign lesion is adenomatous goiter. The histological picture of this lesion varies. There are large and small follicles. The large follicles are lined by flat epithelium and the lumen filled with colloid. The small follicles are lined by thoracal/cuboidal epithelial cells, the lumen is empty or filled with a small amount of colloid. Usually there are fibrosis, haemorrhages and calcifications. Sometimes it is encapsulated and difficult to differentiate from follicular adenoma.[6,16,17]

The most common thyroid malignancy is papillary carcinoma. This lesion is marked by the presence of papillary growth, psammoma bodies and nuclear changes. The nuclear chromatin groups at the periphery of the nucleus and has a ground glass appearance or Orphan Annie nuclei.[6,16,18,19] Whereas at

cytology, we can see intranuclear cytoplasmic invaginations in papillary carcinoma.[6,16,18,20] Not all papillary growth is malignant. There are some differences between papillary carcinoma and papillary hyperplasia. In papillary hyperplasia the cells are arranged as one layer and the round nuclei lay at the basal or at the middle of the cells. The chromatin is delicate and homogenous.[6,16]

In this study, follicular carcinoma is diagnosed by frozen section in 5 cases (17,9%). The malignancy of this tumor is marked by the existence of vascular and capsular invasion.[11,16,17,21] Follicular carcinoma is devided into two types, those are minimally and widely invasive. For pathologist, the main difficulty is in distinguishing minimally invasive follicular carcinoma from follicular adenoma for the two lesions have the same appearance both in histological[11,16,17,19] and cytological picture.[6,15,17] The malignancy is determined by the existence of capsular and vascular invasion. If the capsular and vascular invasion can not be found, the diagnosis must be delayed until paraffin slides are prepared and this lesion is grouped into follicular lesion.[6]

From paraffin section, these follicular lesions consist of adenomatous goitre, follicular adenoma, follicular carcinoma and follicular variant of papillary carcinoma.[6]

In widely invasive thyroid carcinoma, the tumor cells have invaded the blood vessels or spread out of the capsul so that, there is no problem in making the diagnosis.

In this study there were 3 cases (10,7%) of anaplastic carcinoma diagnosed by frozen section. The diagnosis of this type of malignancy is based on the existence of cell anaplasia, without folicle formation and the existence of necrosis. The tumor cells vary in diametres. They can be small with round nuclei and look like malignant lymphoma cells, spindle shaped and look like fibroblast or large and multi-nucleated (giant cells).[6,11,16,19]

This tumor can be differentiated from medullary thyroid carcinoma, because the latter produces some polypeptides and factors, e.g.: calcitonin, carcinoembryonic antigen, ACTH, serotonin, enolase etc.[22-25]

CONCLUSION

As a conclusion, the frozen section diagnosis of the thyroid disorders in Dr. Cipto Mangunkusumo Hospital has a high accuracy and the level of accuracy is the same as the paraffin section diagnosis. Thus, frozen section of the thyroid is still necessary to support surgeon in making diagnosis quickly.

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