ISSN 2618-1584 Vol. 5, Issue 7: 62-66, DOI: 10.25236/FMSR.2023.050709

Pathologic analysis of intraoperative rapid freezing and postoperative paraffin section of thyroid cancer

Zhou Zhiling*

Department of Pathology, Huangshi Aikang Hospital, Huangshi, 443005, China
**Corresponding author:1500293726@qq.com*

Abstract: *To investigate the pathological effects of intraoperative rapid freezing and postoperative paraffin section in thyroid cancer, totally 297 patients with thyroid lesions undergoing surgery were selected from Huangshi Aikang Hospital. All patients underwent intraoperatively rapid freezing and postoperative paraffin section. The diagnostic results of benign and malignant thyroid lesions were compared between the two methods. The diagnostic accuracy of frozen section was 92.55% (87/94), with 210 cases of benign and 87 cases of malignant. The diagnosis of paraffin section showed that 203 cases were benign and 94 cases were malignant. Compared with the diagnosis of postoperative paraffin section, the intraoperative rapid freezing section has higher consistency, higher diagnostic accuracy and shorter production time.*

Keywords: *thyroid cancer; Intraoperative; rapid freezing*

1. Introduction

Thyroid cancer is a common endocrine system tumor, the cause of which is still unclear [1]. It is mostly related to the changes of tumor suppressor genes or oncogenes such as P53 and TRKO, among which vascular endothelial growth factor plays an important role in its pathogenesis [2]. Imaging diagnosis of thyroid cancer is difficult due to the lack of obvious thyroid cancer and the lack of specific manifestations of thyroid cancer. Rapid frozen sections of pathological tissue are performed during surgery for thyroid cancer. The type and nature of lesions can be analyzed in a timely manner to provide rapid and effective basis for surgeons [3]. The duration of intraoperative rapid freezing is generally less than 45 minutes, but due to its poor section quality and limited sampling, the diagnosis results will be affected [4], and postoperative paraffin section is also a commonly used pathological examination method [5]. Therefore, this paper analyzed the diagnostic effects of intraoperative rapid freezing and postoperative paraffin section on thyroid cancer to provide a basis for the diagnosis of thyroid cancer.

2. Materials and Methods

2.1 General Data

A total of 297 patients who underwent surgery for thyroid diseases admitted to Huangshi Aikang Hospital from January 2019 to January 2023 were selected, including 68 males and 229 females, aged 26 ~ 76 years, with an average age of (47.6±8.4) years. Inclusion criteria: All patients underwent surgery for thyroid lesions, and all patients underwent intraoperative rapid freezing and postoperative paraffin section examination. Complete clinical case data; Exclusion criteria: patients with severe cardiac, liver and renal dysfunction and incomplete clinical case data.

2.2 Methods

Intraoperative Frozen section The fresh thyroid tissue submitted for examination was made perpendicular to the thyroid capsule every 0.2cm, and a page shaped parallel incision was made, and the suspicious lesions were observed by naked eye. 1-4 tissues were taken from the junction and the lesions, and then promptly placed into a cold water frozen microtome at constant temperature with OCT as the embedded agent. The freezing temperature was -20℃ ~ -17℃, frozen for 3min, frozen sections were embedded, the thickness of the sections was 5μm, then stained by HE, then dehydrated

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and sealed, sealed for 10min, and then observed under light microscope. Postoperative paraffin sections were made into paraffin sections using the remaining tissue after freezing and then fixed with 10% neutral formaldehyde, followed by routine dehydration, transparency, wax dipping and embedding, and then sectionalized with a thickness of 4μm. HE staining was performed and then observed under a light microscope. The intraoperative rapid frozen section and postoperative paraffin section were reviewed by two physicians, and the diagnostic results were given and compared. The paraffin section shows that the tumor capsule is infiltrated or the lymphatic vessel or blood vessel cancerous thrombus is confirmed to be malignant, otherwise it is benign. If the frozen section is completely consistent with the paraffin section, the pathological types of the frozen section and the paraffin section are different, but the diagnostic results are basically consistent, and the above two diagnostic results are confirmed. When the nature and type of the lesion cannot be determined by the rapid frozen section during the operation, it is considered as delayed diagnosis, and postoperative paraffin section diagnosis is required. False negative and false positive are misdiagnoses, in which malignant lesions are diagnosed as benign lesions as false negative, and benign lesions as positive lesions as false positive [6].

2.3 Observation indicators

(1) The diagnostic results of the two methods were compared; (2) The diagnostic results of thyroid malignant lesions were compared between the two methods. 24 Statistical analysis was performed using SPSS24.0, and counting data were represented by frequency or %. $P < 0.05$ was considered statistically significant.

3. Results

3.1 Comparison of benign and malignant diagnosis results of the two methods

Frozen section diagnosis found 210 benign cases and 87 malignant cases, the diagnostic accuracy was 92.55% (87/94), paraffin section diagnosis found 203 benign cases and 94 malignant cases, as shown in Table 1.

Table 1 Comparison of benign and malignant diagnosis results of the two methods [example]

	Benign	malignant	delayed diagnosis	total
Frozen section	210	86	1	297
Paraffin section	203	94	0	297

3.2 Comparison of the diagnosis results of malignant thyroid lesions by the two methods

In paraffin sections, there were 21 cases of malignant lesions, including 17 cases of papillary carcinoma, 2 cases of follicular carcinoma and 2 cases of medullary carcinoma. In the frozen section, 18 cases were completely consistent, 1 case was misdiagnosed, and follicular carcinoma was misdiagnosed as benign tumor, and 1 case was delayed diagnosis, as shown in Table 2.

Table 2 Comparison of the diagnostic results of malignant thyroid lesions by two methods [Example]

Paraffin section	Frozen section diagnosis		false negative	delayed diagnosis	total
	Fit perfectly	Basically agree			
Follicular cancer	2	0	0	0	2
Papillary carcinoma	78	0	6	1	84

4. Discussion

Thyroid disease is a common clinical disease type, intraoperative gross observation and preoperative ultrasonography have limitations in the diagnosis of the disease. Thyroid cancer is more common in female patients, and sex differences in thyroid lesions may be related to the influence of estrogen secretion on the thyroid gland [7]. In recent years, its incidence has been increasing year by year, and the main causes include abnormal iodine uptake, ionizing radiation, autoimmune diseases,

ISSN 2618-1584 Vol. 5, Issue 7: 62-66, DOI: 10.25236/FMSR.2023.050709

genetic factors and estrogen, etc. The pathogenesis is complex. Clinical preoperative diagnosis methods include nuclide imaging, palpation, CT diagnosis, etc., but its effectiveness is low and the diagnostic effect is not satisfactory. Intraoperative rapid frozen section is a commonly used pathological diagnosis method, which can provide a basis for surgeons to choose the appropriate surgical method and scope. For malignant tumors diagnosed before surgery, doctors can observe the tissue edge after intraoperative resection of the tumor to determine whether the tumor is completely removed, so as to avoid causing a second operation. However, some studies have found [8] that it is affected by various factors. The use of intraoperative rapid frozen sections may lead to delayed diagnosis and misdiagnosis. False positives in misdiagnosis may easily lead to medical disputes, and false negatives may easily lead to secondary surgery. In this paper, postoperative paraffin section was found to be benign in 203 cases and malignant in 94 cases, while intraoperative rapid frozen section was found to be benign in 203 cases and malignant in 87 cases, with an accuracy rate of 92.55%, indicating that intraoperative rapid frozen section is of high diagnostic value for thyroid gland. There were 94 cases of malignant lesions, of which 97.87% (92/94) were papillary carcinoma, indicating that it is of great significance to strengthen the structural understanding of the rapid frozen section of papillary carcinoma during operation. The characteristics of papillary carcinoma of thyroid cancer include fibrotic interstitium, papillary structure, characteristic nucleus and sandy body, among which the most critical feature is characteristic nucleus. If the nucleus is enlarged, pseudoinclusion bodies appear in the nucleus, crowded and overlapping in the nucleus, nuclear furrow, ground glass nucleus and irregular nuclear profile appear in the nucleus, papillary carcinoma can be confirmed by pathology. In addition, rapid ice section during operation has no shrinkage and dehydration effect, resulting in a smaller structural gap and more dense structure of papillary carcinoma, which is easier to identify compared with postoperative paraffin section [9]. There were 2 cases of follicular carcinoma, accounting for 2.13% (2/94). There were 80 cases of complete agreement, 6 cases of missed diagnosis and 1 case of delay.Late diagnosis. All the missed cases were microscopic papillary carcinoma with frozen samples, which was the main reason for the inconsistency between intraoperative freezing and postoperative paraffin diagnosis. The microscopic papillary carcinoma of the thyroid in Figure1A and B showed fibrosis and calcification foci during intraoperative freezing in Figure 1 C and D. In order to reduce the missed diagnosis of minor lesions and avoid the impression that ancestors are the main source of the sample, on the basis of sampling typical lesions, at the same time, the surrounding thyroid gland was performed at a vertical page incision every 2mm and palpated with the finger abdomen. Grayish nodules, fibrous scar tissue, and small nodules to the touch should be thoroughly sampled to detect any suspected lesions. In addition, the pathologist can also refer to the preoperative color ultrasound examination results, for suspected malignant small nodules, should be carefully examined to reduce the occurrence of missed diagnosis. As for the freezing diagnosis of thyroid follicular tumors, Grisales et al. [11] conducted a meta-analysis of 46 studies from 1991 to 2018 and found that the overall sensitivity and specificity of freezing pathological examination for the diagnosis of thyroid follicular tumors were 43% and 100%, respectively, and the sensitivity of frozen section for the diagnosis of thyroid follicular tumors was low. Its use in intraoperative decision making is limited and routine freezing is not recommended. Studies by other foreign scholars [12-14] also hold that. Freeze pathological examination of thyroid follicular tumor .The diagnostic value is very limited, especially for the diagnosis of thyroid follicular cancer, because its diagnosis depends on the observation of the entire tumor for capsule and/or vascular invasion, and frozen sampling is only local sampling, and can not represent the situation of the entire tumor, therefore, it is not recommended to perform routine freezing examination for thyroid follicular tumors.

Frozen sections are characterized by fibrosis and calcification with few cells, while paraffin sections have increased cells and papillary glands. The diagnostic value of frozen sections is very limited, especially for the diagnosis of thyroid follicular carcinoma, because the diagnosis depends on the observation of the entire tumor with or without capsule and/or vascular invasion, and frozen sampling is only local sampling, which cannot represent the situation of the entire tumor. Routine freezing is not recommended for follicular thyroid tumors. When frozen sampling, it is necessary to first observe whether the surface of the nodules is smooth, whether the envelope is complete, and whether there are suspicious satellite nodules around the nodules. If there is a fibrous thickened envelope in the frozen section. The possibility of thyroid follicular carcinoma should be vigilant. For suspected capsular or vascular invasion that cannot be clearly defined, all nodules should be taken during routine pathological examination, and the capsular and vascular invasion situation should be carefully evaluated under the microscope to finally determine the nature of the lesion.

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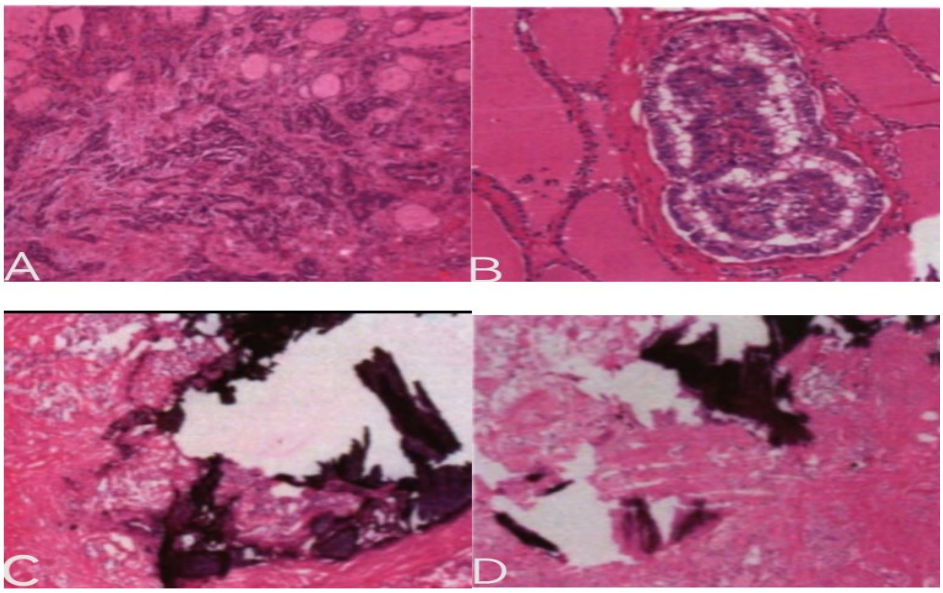

(A, B. False-negative cases: microscopic papillary carcinoma.C .D.Fibrotic calcification)

Figure 1. shows a small papillary carcinoma of the thyroid

5. Conclusions

Are summarized above. The complexity of histological structure of thyroid lesions and the omission of minor lesions from frozen samples are the main factors that cause the inconsistency between intraoperative freezing and postoperative pathological diagnosis. The analysis of frozen pathological diagnosis is helpful to improve the methods of gross examination and sampling of frozen specimens, improve the quality of frozen sections and staining, enrich the experience of pathologists in the diagnosis of frozen sections, and promote the further increase of the diagnosis rate of frozen section pathology.

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ISSN 2618-1584 Vol. 5, Issue 7: 62-66, DOI: 10.25236/FMSR.2023.050709

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