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# Analysis of the Results on the Use of Frozen Sections and Smears—Imprints in Express Diagnosis of Tumoral Processes in Children and Adolescents in Ukraine After the Chernobyl Accident

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**Abstract.** It has been carried out a comparative analysis of the conformity of the results of instant diagnosis made on frozen sections (152 biopsies), with the final conclusion on fixed preparations of thyroid tumors in children and adolescents of Ukraine. The benign nodular and multinodular hyperplastic processes on frozen slices are verified in 100% of observations (48 cases). In case of follicular adenoma the coincidence in diagnosis made 90.1% (55 cases), in case of papillary carcinoma it made 91.1% (45 cases). In case of follicular (3 cases) and medullary (1 case) thyroid carcinomas, presence of carcinoma was suspected but the accurate diagnosis was made on fixed preparations. Thus, instant diagnosis on frozen sections of thyroid tumors allows, in more than 90%, to make the accurate diagnosis of a tumoral process in the course of operation and to choose adequate tactics of surgical treatment.

The increase in thyroid cancer cases among children and adolescents in Ukraine after the Chernobyl accident makes it necessary to carry out morphological studies of thyroid nodules at three stages: preoperatively (cytological study of the puncture material with fine-needle aspiration biopsy), intraoperatively (express diagnosis using frozen sections and smears-imprints) and postoperatively (histological study of paraffin-embedded sections). Among the methods mentioned express diagnosis using frozen sections plays a special role since it helps surgeons to choose a proper surgical treatment and define the extent of surgery at the time of operation. Modern equipment provided to us by the European Commission within the International Scientific Project ECP-8 as well as methods of accelerated specimen staining allow a conclusion on the form of pathological process in the thyroid gland within 15 minutes after the biopsy material has been taken to the laboratory of morphology.

Analysis of the material that required intraoperative verification of the diagnosis in 1994-1995 (152 biopsies by 1.07.95) showed that benign nodular and multi-

nodular hyperplastic processes in children and adolescents (48 cases) are verified on frozen sections in 100% of cases. In multinodular thyroid lesions sections from all nodules should be studied to exclude the presence of carcinoma in any of them. The histologic structure of benign nodes may be different – microfollicular, normo-follicular or mixed. A part of nodes may undergo a cystic degeneration or massive fibrotization of central part. Some nodes in multinodular lesion of thyroid gland have a capsule of irregular thickness and resemble adenomas as to their structure. In such cases, in our opinion the histologic conclusion must reflect this feature of their structure and be called "multinodular adenomatous goiter" of thyroid gland. In the case of follicular adenoma (55) intraoperative and postoperative diagnosis coincided in 90.1% of cases. In 9.9% of instances the conclusion was indefinite because solitary encapsulated tumors often require an additional study of subcapsular areas and capsule in paraffin-embedded sections to exclude minimally invasive follicular carcinoma or follicular variant of papillary carcinoma. In the latter case it is advisable to perform an additional analysis of cytological characteristics of tumor cell nuclei using smears-imprints. The main nuclear peculiarities in neoplastic cells are: their large size, enlightenment and dust-like chromatin. Nuclear polymorphism is moderate. Intranuclear cytoplasm inclusions were found in more than half bioplates under study. The major peculiarities of tumor cell nuclei in papillary carcinoma are low optical density (clear nuclei), dust-like chromatin, grooving and intranuclear cytoplasmic inclusions [1].

A pathologist who studies follicular adenoma (and other thyroid lesions) on frozen (and paraffin-embedded) sections should know whether fine-needle aspiration biopsy was performed because this assay can imitate capsular invasion and cause false diagnosis of "minimally invasive follicular carcinoma" [2]. The main difference between "puncture" capsular invasion and the true one is presence of hemorrhages in the parenchyma of the gland and inside separate follicles at the site of puncture, existence of inflammatory reaction at the site of cell entry as well as normal cell structure.

Follicular carcinoma causes particular difficulty when the diagnosis is made on frozen sections. As a rule it is a solitary nodule in dense capsule of various thickness showing follicular pattern. Usually in children and adolescents minimally invasive follicular carcinoma is diagnosed and brings about additional difficulties with its identification. The probability to find capsular or vascular invasion on 3–4 frozen sections during express-biopsy is very low, that is why often the diagnosis was rather ambiguous being "follicular neoplasm" [2]. Such a diagnosis, to a certain extent, made surgeons to perform a more radical operation than that performed for follicular adenoma. In children follicular carcinomas are extremely uncommon (3 cases over 1.5 years), that is why certain difficulties in diagnosis of this pathology in express diagnosis cannot diminish the value of this method in differential diagnosis of neoplastic processes in the thyroid gland.

In papillary carcinoma (45) the diagnoses coincided in 91.1% of cases, in 2.2% of instances (one case of encapsulated follicular variant of papillary carcinoma) the result was false-negative and in 6.7% of cases carcinoma was suspected but the precise diagnosis was made on paraffin-embedded specimens. Unfortunately, one cannot rely upon nuclear cytologic feature in frozen sections since the majority of nuclei often demonstrate swelling, become clear and contain false (artefact)

intranuclear inclusion. In this respect imprint smears are very helpful preserving nuclear cytologic features of papillary carcinoma. On frozen sections papillary carcinoma is diagnosed by the presence of true papillary structures with prominent fibrovascular core, tumor invasion to the adjacent thyroid tissue as well as tumor cell invasion to the lymphatic and blood vessels and the capsule. Sometimes transcapsular invasion forming mushroom-like structures or tumor cell spreading over the adjacent soft tissues is observed. Finding of psammoma bodies on the frozen sections of the thyroid gland is an important diagnostic sign. Psammoma bodies can be located among tumor cells, within papillary structures, in the stroma of the tumor and in the lumina of lymphatic vessels. Psammoma bodies should be distinguished from calcificates which may be found in other thyroid lesions as well, benign ones included. Usually psammoma bodies demonstrate regular rounded shape and laminated structure which is well seen at the extreme low position of the microscope condenser. The amount of psammoma bodies in different papillary carcinomas vary considerably: commonly, there are single instances in follicular variant of papillary carcinoma and they are numerous in diffuse sclerosing variant. It should be mentioned that psammoma bodies may be absent in some papillary carcinomas (at least on the tumor sections available) but they may be found in regional lymph node metastases.

Anaplastic carcinoma (1) is easily diagnosed on frozen sections by the growth of small roundish or angular cells with a dense round nucleus, by marked invasion into blood vessels and capsule, by presence of mitosis, invasion of capsule, presence of metastases into adjacent soft tissues. The anaplastic carcinoma must be differentiated from medullary carcinoma which is noted more often in children and adolescents. The latter is usually represented by spindle cells gathered in isolated small islets surrounded with thick layers of connective tissue [3]. Mitosis in medullary carcinoma are rarely determined, invasion is noted into blood vessels and capsule.

Further accumulation of the material and its analysis will make it possible to determine more exactly diagnostic value of the signs mentioned and to unify diagnostic approaches so as to reduce the percentage of errors in preoperative diagnosis.

Thus it is concluded that the study of frozen sections and smears is an important additional method of differential diagnosis of tumoral processes in the thyroid gland. It allows morphological diagnosis in more than 90% of cases at surgery as well as selection of the adequate tactics of surgical treatment.

## References

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