

Role of "Cellular Swirls" In the Cytodiagnosis of Papillary Carcinoma Thyroid

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Abstract:

Introduction: Papillary thyroid carcinoma (PTC) accounts for 70–80% of thyroid cancers and of good prognosis with very minimal rate of metastasis. Till date no single cytological feature is pathognomonic of PTC. Hence we have looked into criterion- Cellular swirls described by Szoporn for the diagnosis of papillary carcinoma on FNA.

Materials and methods: 30 cases of PTC & 30 cases of colloid goitre FNA were reviewed for the cytological features. Cytological features evaluated are papillary structure formations, nuclear grooves (NG), intranuclear cytoplasmic inclusions (INCI), nuclear pleomorphism, nuclear chromatin, psammoma bodies, cellular swirls, multinucleated giant cell (MGC) and colloid. All 60 cases in the study had confirmatory diagnosis on histopathology. Cellular swirls consisted of concentrically organized aggregates of about 50–200 tumor cells, in which most of the peripherally situated cells have ovoid nuclei, the long axes of which were oriented perpendicular to the radius of the swirl and did not contain any colloid. Pathologists were blind folded for final diagnosis while reviewing the cytology smears.

Results & Conclusion: Cellular swirls which were easily identified at low magnification are found in a 18 of 30 cases (60%) of FNAs of papillary carcinoma, but not in FNAs of colloid goiter in our study. We found papillary formations, intra nuclear cytoplasmic inclusion, nuclear groove, and multi nucleated giant cells are important features on FNA smears in diagnosis of PTC. Cellular swirls are novel finding and when present in cytology smears, are highly specific of PTC. Cellular swirls is a useful cytological finding in diagnosis of PTC along with other cytological findings.

I. Introduction

Thyroid nodules are a common finding in everyday clinical practice. Fine-needle aspiration (FNA) has been effective in triaging of thyroid lesions and dominant method for the preliminary investigation. ^[1,2] Colloid nodule (CN) is the most common benign thyroid lesion and thereby a common diagnosis made with thyroid FNA. ^[3] The differential diagnosis for Colloid nodule in fine needle aspiration most often includes cystic thyroid malignancy particularly Papillary carcinoma and thyroid lesions of follicular-pattern. Papillary thyroid carcinoma (PTC) accounts for 70–80% of thyroid cancers and have good prognosis with very minimal rate of metastasis. ^[4] Till date no single cytological feature is pathognomonic of PTC and it's a martini of several recognized criteria in any given case make the diagnosis of PTC more likely. Hence we have looked into criterion- Cellular swirls described by Szoporn for the diagnosis of papillary carcinoma on FNA. ^[5] These structures have been previously reported in limited literature and their relationship to PTC is not well established.

II. Subjects and Methods

After obtaining institutional ethical clearance, 30 cases of PTC on FNA with H & E/ Papanicolaou-stained and/or Giemsa stained smears, were reviewed for the cytological features. An additional 30 similarly stained and prepared thyroid FNAs, diagnosed as colloid goiter were also reviewed for the presence of same cytological parameters. Cytological features evaluated are papillary structure formations, nuclear grooves (NG), intranuclear cytoplasmic inclusions (INCI), nuclear pleomorphism, nuclear chromatin, psammoma bodies, cellular swirls, multinucleated giant cell (MGC) and colloid. All 60 cases in the study had confirmatory diagnosis on histopathology. Pathologist was blind folded for final diagnosis while reviewing the cytology smears.

Cellular swirls consisted of concentrically organized aggregates of about 50–200 tumor cells, in which most of the peripherally situated cells have ovoid nuclei, the long axes of which were oriented perpendicular to the radius of the swirl and did not contain any colloid. ^[5]

III. Results

Ages ranged from 30 to 65 years and 22 to 45 years for papillary carcinoma and colloid goiter respectively with maximum number of cases in the age group of 20-40 years for both the lesions. Females were predominantly affected in papillary carcinoma (4.1: 1) and in colloid goiter (3:1) compared to males.

In the cytological smears frequency of papillary formations were higher in 23 (76.67 %) cases of papillary carcinoma compared to that of in three (8%) cases of colloid goiter. These papillary structures were noted more frequently in PTC cases which had moderate cellularity. In contrast most of the colloid goiter on FNA had scant to moderate cellularity with architectural arrangement predominantly of clusters, macrofollicles and in sheets. Nuclear groove were noted in 26 cases (86.7%) of PTC cases and in three (10%) of CG cases. Nuclear groove in papillary carcinoma were transpolar and well defined in nature. In contrast grooves in colloid goiter were delicate. Nuclear inclusion was seen in 21 cases (70%) and one case (3.4%) of papillary carcinoma and colloid goiter respectively. Multinucleated giant cells were noted in 16 cases (53.34%) and four cases (13.34%) of PTC and CG respectively. Giant cell in colloid goiter were smaller having foamy cytoplasm and few nuclei. In contrast, giant cells in papillary carcinoma cases were larger with diverse shape, dense cytoplasm and more nuclei. Viscous, abundant colloid was present in 80% and 10% of colloid goiter and papillary carcinoma respectively. Scant colloid was seen in PTC accounting for 80% of cases. Psammoma bodies was identified in one case of PTC.

Cellular swirls, as described earlier were easily observed at screening magnification [Fig-1] and confirmed at high magnification [Fig-2]. Eighteen of 30 (60%) papillary carcinoma thyroid cases contained cellular swirls, and none of the colloid goiter cases showed these structures.

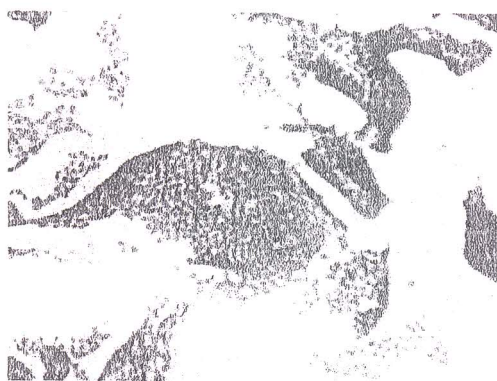


Figure-1: Microphotograph showing Cellular swirls .PAP x100

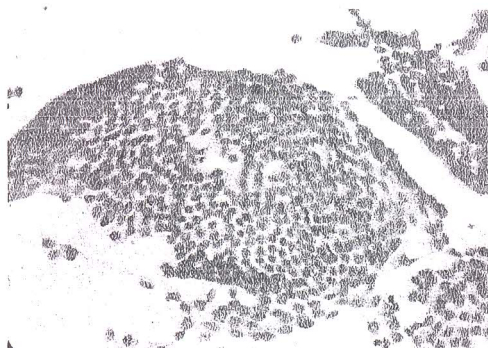


Figure-2: Microphotograph showing Cellular swirl .PAP x400

IV. Discussion

Thyroid carcinoma is the most common endocrine malignancy. Papillary carcinomas are the most common form of thyroid cancer and can occur throughout life but most often between the ages of 25 and 50. [6, 7] In literature diagnostic features for PTC include papillary tissue fragments, monolayered sheets, multinucleated giant cells, syncytial tissue fragments, nuclear grooves, nuclear inclusions, and psammoma bodies. [8, 9] Another list of criteria was listed for PTC and had 13 features which was divided into four categories, architectural (papillae with/ without fibrovascular cores, sheets with fingers), cytoplasmic (septate vacuoles, squamoid nature

of cell), nuclear (INCI, grooves, fine chromatin, marginated nucleoli) and background (psammoma bodies, giant cells, gummy/thin colloid).^[10] List of criteria for the diagnosis of PTC by FNA has continued to grow and varies in different studies. Despite all these studies and well-defined cytological features in FNA smears, diagnostic difficulties exist resulting in lower diagnostic accuracy.

In our study nuclear groove were seen in 86.67% of PTC and 10% of colloid goiter cases. This finding is similar to the finding observed by Rupp et al, who described their utility in PTC. In their study 17 of 20 papillary carcinomas (85%) and less than 25% cases of other thyroid lesions showed nuclear groove.^[11] In contrast, one study reported, nuclear groove in PTC (38%), follicular adenoma/carcinoma (10%), nodular goiter (22.5%), Hashimoto's thyroiditis (14%) and medullary carcinoma (16%).^[12] Another nuclear cytological parameter - Nuclear inclusion were seen in 70% of PTC and 3.4% of colloid goiter in our study. This finding is similar to the finding observed in other studies.^[13] Yang GC et al, proposed that in a single aspirate, more than three INCI in enlarged nuclei is pathognomonic of PTC.^[14] In many other literatures, INCI and NG is also found in variety of lesion such as colloid goiter, follicular adenoma, hyalinizing trabecular adenoma, and medullary carcinoma.^[12, 13, 15]

Amongst other cytological features, we observed multi nucleated giant cells in 53.34% cases of PTC and 13.34% in CG and cyst macrophages in 26.67% and 66.67% of PTC and CG respectively. In study by Tsou et al, the morphology of MGC in benign nodular goiter tended to be smaller with foamy cytoplasm and few nuclei.^[16] In contrast MGC in PTC cases were larger with dense cytoplasm and many nuclei. Similar morphology of multinucleated giant cell is observed in our study. Such large multinucleated giant cell with many nuclei and dense cytoplasm should prompt a careful look out for associative PTC.^[17, 18] In literature, psammoma bodies were considered diagnostic of PTC, but are seen only in 11-35% of cases.^[19] In our study, psammoma bodies seen in only one case of PTC.

Cellular swirls were easily identified at low magnification. They are found in 18 cases (60%) of papillary carcinoma, but not in FNAs of colloid goiter in our study. In a study by Szporn et al in 2006, who first described these structures in 17 of 100 FNAs (17%) of papillary carcinoma contained cellular swirls. No cases diagnosed as Hashimoto's thyroiditis, nodular goiter, or follicular neoplasm contained these structures. Hence it was concluded that cellular swirls are a finding that is highly specific to PTC.^[5] Kumar et al, found cellular swirls in all the four cases of PTC in their study and remarked that it is a novel finding and when present are highly specific for PTC. Cellular swirls should not be confused with the spherules or whorl like structure, which may be seen in thyroid cytology.^[20] Kuma et al, reported whorl-like structures in cribriform-morular variant of PTC. These whorls like structure consists cells which have prominent nuclear changes with enlarged nuclei, thickened nuclear membranes.^[21] In contrast cellular swirls have bland nuclear features. Mesonero et al, had described spherules, an architectural pattern similar to that of cellular swirls, in macrofollicular subtype of the follicular variant of PTC.^[22] In contrast, cellular swirls are relatively flat, 2-dimensional structures and are not associated with colloid.

During the study period we also looked into eight cases of papillary carcinoma which were misdiagnosed as colloid/nodular goiter in cytology smears. On retrospective analysis there was no definitive cytology features of PTC observed in these cases. It may be very difficult to sample the small lesion without ultrasound guidance. In such scenario ultrasound guide FNAC helps in obtaining the representative sample and in improving the diagnosis.

In another two cases, false positive diagnosis of PTC was given on cytology, in which one case revealed nuclear grooves and the other case had high cellularity with occasional nuclear inclusion in them. These cases on histopathology turned out to be hashimoto's thyroiditis and multi nodular goiter respectively.

In conclusion, papillary formations, intra nuclear cytoplasmic inclusion, nuclear groove, and multi nucleated giant cells are important features in FNA smears that favor a diagnosis of PTC. Though nuclear changes and other cytological features are neither constant nor specific, they should be reported in proper context. Cellular swirls are novel finding and when present in cytology smears, are highly specific of PTC and it is a useful additional cytological finding in diagnosis of PTC.

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