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Role of Nuclear Grooves in Cytological Diagnosis of Papillary Carcinoma Thyroid

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Abstract: It is well known that nuclear grooves play a major role in the diagnosis of papillary carcinoma thyroid. Also grooves are found in many non- neoplastic lesions of thyroid. To calculate the percentage of nuclear grooves in histopathologically proven cases of papillary carcinoma and non –neoplastic lesions (hashimoto's thyroiditis and colloid goiter). This retrospective study was carried out by reviewing the data and cytology smears of 21 histopathologically confirmed cases of papillary carcinoma thyroid and 10 cases each of hashimoto's thyoiditis and colloid goitre. The percentage of nuclear grooves was calculated in oil immersion by counting 100 to 500 cells depending on the cellularity. The percentage of nuclear grooving ranged from 15% to 85% in the papillary carcinoma cases. Greater than 20% nuclear grooves were observed in 19(90.4%) of the cases. Nuclear crowding and overlapping, pale chromatin, nuclear grooves, nuclear enlargement and prominent nucleoli were seen in all (100%) the cases. Intranuclear cytoplasmic pseudoinclusions were seen in only 5(23.8%) of the cases. Histiocytes, metaplastic cells and multinucleated giant cells were seen in 12(57.1%), 10(47.6%) and 6(28.5%) of the cases. The percentage of nuclear grooves in non neoplastic cases overall observed was <10%. The sensitivity and specificity of grooves for PCT at >=20% were 90.5% and 100% respectively. Whenever in doubt, a diagnosis of papillary carcinoma can be offered confidently by this semiquantitative approach for grooves in combination with other features.
Keywords: Nuclear grooves, papillary carcinoma cytology, percentage of nuclear grooves.

INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) is a widely accepted and sensitive diagnostic tool for thyroid lesions. Being minimally invasive test, it has gained a lot of importance as this simple test can avoid unnecessary surgical resections in a good number of cases [1]. Cytological diagnosis of Papillary Carcinoma Thyroid (PCT) is easy and can be rendered confidently when characteristic features such as papillary fragments, unequivocal intranuclear cytoplasmic inclusions, nuclear grooves, pale chromatin, chewing colloid and nuclear enlargementare present [2]. It is well known that nuclear grooves play a major role in the diagnosis of PCT. But grooves can be present in many non-papillary carcinoma lesions of thyroid as well [3-5].

MATERIALS AND METHODS

This was a retrospective study of sample size 41 conducted in the Department of Pathology, Father Muller Medical College, with the approval of institution ethical clearance committee, and included cases reported during a two year period from September 2013 to September 2015. The study included 21 cases of PCT which were histopathologically confirmed. The control group included 20 cases, 10 each of Hashimotos thyroiditis and Nodular Colloid Goitre. The clinical data, slides and smears of the cases were retrieved and analysed.

The percentage of cells exhibiting nuclear grooves was calculated by counting 100 to 500 cells depending on the cellularity in each case. The mean was taken. The counting was done in oil immersion (100X). The counting was done in fields exhibiting maximum cells with grooved nucleus.

Statistics

The sensitivity and specificity were calculated using the formulae:

Sensitivity = True positive/(True positive +False negative)

Specificity = True negative/(True negative+False positive)

RESULTS

Among the 21 histopathologically confirmed cases of PCT, nuclear grooves, nuclear crowding, overlapping, pale chromatin, nucleomegaly and prominent nucleoli were seen in all(100%) the cases. Intranuclear cytoplasmic pseudoinclusions were seen in only 5(23.8%) cases.

The percentage of nuclear grooves in PCT cases ranged from as low as 15% to as high as 85%. Grooves at >= 20% were seen in 19(90.4%) of the 21 cases. Grooves at >=10% were seen in all (100%) cases.

Among the 10 Nodular Colloid Goitre cases, the percentage of cells with grooves ranged from 0 to 10%. Among the 10 Hashimotos thyroiditis cases, the percentage of cells with nuclear grooves ranged from 1% to 8%.

The sensitivity and specificity of grooves for PCT at >=20% were 90.5% and 100% respectively.

The sensitivity and specificity of grooves for PCT at >=10% were100% and 95% respectively.

DISCUSSION

The grooving of nucleus in PCT was first described in 1986 by Chan et al, but this was in the histopathological section [5]. The nuclear grooving was first described in Fine needle aspiration smears by Rupp and Ehya [6].

Various studies have demonstrated the presence of nuclear grooves in non-papillary carcinoma lesions of thyroid also [3-5].

But the dilemma and the controversies regarding the cut-off for considering grooving significant still remained.

In a study by Rupp and Ehya [6] they analysed 20 papillary carcinomas cases of the thyroid, 10 follicular adenomas, 3 follicular carcinomas, 1 medullary carcinoma, 10 nodular goiters and 4 cases of Hashimoto's thyroiditis. In each case 30 random high power fields or all the fields in cases with less cellularity were examined for the percentage of cells exhibiting nuclear grooving. Of the total 20 PCT cases, 17 cases (85%) showed grooving in >25% of the high power fields examined. While all the non-papillary carcinoma thyroid lesions showed occasional (<25% of the high power fields) or no grooving.

Shurbaji, Frost and Guptaconducted a study on 124 thyroid lesions which included 11 PCT cases, 01 follicular carcinoma, 06 follicular adenomas, 08 follicular neoplasms not otherwise specified, 10 cases of chronic thyroiditis, and 88 colloid nodules/adenomatous goiters [7]. Among the PCT cases, grooves were found in all the 11 cases. While among the 113 non-PCT cases, only 2(1.8%) cases showed grooves, both of which were colloid goiters, one with extensive hurthe cell metaplasia. They also found that grooves are better appreciated in wet fixed Papanicolaou-stained smears than air dried Diff-quick stained smears. In our study too we found Papanicolaou stained smears better for identification of grooved nucleus.

In 1990, Bhambani, Kashyap and Das [8] studied nuclear grooves in May Grunwald Giemsa (MGG) stained smears. They observed nuclear grooves in 88% of the cases of PCT. They concluded that nuclear grooves can be used as a possible marker of PCT in MGG stained smears also.

Gould, Watzak, Chamizo *et al*., [9] studied 69 FNA smears and demonstrated grooves in 100% cases of PCT, 70% cases of non-papillary carcinoma and 56% of non-neoplastic thyroid cases. They estimated the percent of cells showing grooves by examining random 5 High power fields.

In another study by Yang and Demrici [10], of the total 48 cases of histologically confirmed papillary carcinoma, nuclear grooves were found at greater than equal to 20% in 31 cases (65%) and 10–19% in 17 cases (35%). And among the 15 cases of histologically confirmed non-neoplastic cases, 4 cases (27%) showed 10-19% cells with nuclear grooves while 11 cases (74%) showed <= 10% cells with grooves. The sensitivity and specificity of nuclear grooves for PCT were 65% and 95% respectively at the level of >=20%. While those at the level of <= 10% were 100% and 68% respectively.

In a study by Jing and Michael [11] where in they reviewed 22 cases which were cytologically diagnosed as PCT but did not correlate histologically, they found that occasional nuclear grooves were present in all the 22 cases. They were of the opinion that occasional nuclear grooves may lead to a false positive diagnosis of PCT.

CONCLUSION

To conclude, nuclear grooves can be seen in PCT as well as non-papillary carcinoma cases including non-neoplastic lesions of thyroid. A false-positive diagnosis may be rendered by the presence of focal and occasional nuclear grooving while a false-negative diagnosis may be a result of overlooking few nuclear grooves. Hence, this semiquantative approach may improve the diagnostic accuracy. >=20% cells with

nuclear grooves is virtually diagnostic of PCT in our experience.

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