

## Diagnosis of Parathyroid Adenoma Using Intraoperative Squash Cytology and Frozen Sections-A Rare Case Report

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**Abstract:** The identification of parathyroid gland tissue and its distinction from surrounding structures such as thyroid gland, lymphoid, fibroadipose, and, rarely, thymic tissues on frozen section (FS) may be challenging owing to freezing artifact and small biopsy sent for FS. Intraoperative cytology (IC) provides valuable complementary morphologic details. We evaluated a case by IC alone, followed by interpretation with FS to reach a final interpretation using IC and FS together. IC is a valuable adjunct to FS during intraoperative consultation for evaluation of tissue in a parathyroid location. We present a rare case of parathyroid adenoma which was evaluated by relatively faster procedure of squash cytology first and then confirmed on FS for effective diagnosis. The present study infers that a combined approach of IC and FS is preferable to using FS or IC alone.

**Keywords:** Parathyroid adenoma, Intraoperative Squash Cytology (IC) and Frozen Sections (FS).

### I. Introduction

Intraoperative cytology (IC), in general, has been demonstrated to be an excellent diagnostic tool with high sensitivity and specificity in many studies that have compared IC with frozen section (FS).<sup>1-4</sup> Owing to various factors, including freezing artifacts, small specimen, and unusual histomorphologic features, the distinction of parathyroid gland tissue (PT) from adjacent tissues sometimes may be difficult with FS alone.

Several studies have reported high diagnostic accuracy with smear cytology for interpreting different tissues in a parathyroid location.<sup>5,6</sup> The comparison of IC with FS for the interpretation of tissue in a parathyroid location has been recommended by some of these studies.<sup>6</sup> We evaluated the role of IC with FS for the diagnosis of parathyroid adenoma.

### II. Case Report

A 50-year-old female, resident of Mumbai came with complaints of bodyache and joint pains since one year. The patient had developed chronic pyelonephritis one year back for which she was operated with right nephrectomy in past. Since then she started having bodyache, mainly in lower limbs. No associated fever, loose motions/constipation, hematemesis/melena, chest pains/shortness of breath, no history of dysphagia. She had no history of diabetes mellitus, hypertension, tuberculosis contact or ischemic heart diseases. She had history of hysterectomy ten years back. Her family history was insignificant. Her vitals and routine blood examination were all normal.

Her chest X-ray was normal. The USG-neck revealed a 3.1x1.2x1.9 cm sized heterogeneously hypoechoic lesion with few cystic areas within. It was seen at the inferior pole of left thyroid lobe. It showed peripheral vascularity on Doppler study. No calcific foci within. Laterally it was abutting the left common carotid artery, however normal wall to wall colour flow. Impression was given as parathyroid tumour.

This was followed by CT-scan of brain (plain and contrast) and neck which revealed normal brain findings but a well-defined centrally hypodense mass lesion on postero-inferior to the left lobe of thyroid gland without obvious thyroid lesion. It was suggestive of parathyroid adenoma. With this in mind, vitamin D levels were estimated. The reference levels are 30 to 60 ng/ml. Vitamin D levels are inversely proportional to PTH levels. So in our patient, the vitamin D levels were 29 ng/ml.

The patient was posted for parathyroidectomy from the involved site. We received a resected single tissue for frozen section, measuring 2x2x1 cm, as the surgeons wanted to confirm it as parathyroid tumour. It was capsulated, tan colour, smooth capsular surface and cut surface was solid, soft, light brown coloured. We prepared squash smears and fixed it in 95% ethanol instantly. Also tissue bits with capsular surface were sent for frozen sectioning. The time required for IC was 9 minutes and for FS was 18 minutes. The cytological H&E stained-smears were obtained faster and helped in cellular study to diagnose it as parathyroid adenoma (Fig. 1) After this, we received H&E stained smears from FS procedure, which confirmed our diagnosis (Fig. 2). Thus we could correlate our findings and diagnosis of IC and FS.

### III. Discussion

Agarwal AM et al. (2009)<sup>7</sup> studied the parathyroid fine-needle aspiration cytology in the evaluation of parathyroid adenoma (PA)-cytologic findings from 53 patients. Majority of the samples with parathyroid cells showed moderate cellularity with monomorphous round to slightly oval cells predominantly arranged in loose two-dimensional clusters with occasional papillary fragments. Majority of them exhibited a stippled nuclear chromatin. No significant pleomorphism, mitotic activity, or prominent nucleoli were observed. Most samples showed bare nuclei in the background due to tendency to rupture like thyroid follicular cells. They concluded that US-guided FNAC has its limitations because of low sensitivity in primary localization of the parathyroid adenoma in cases of primary hyperparathyroidism and is not a useful mode of investigation in cases of PA. Thus as pre-operative guided cytology is not helpful at times, the surgeons suggest CT-neck and frozen sectioning studies like in our case.

Geelhoed GW & Silverberg SG (1984)<sup>8</sup> inferred that parathyroid imprint by touch preparation technique allowed cytologic examination in less than 1 minute per specimen, with ready identification of the presence or absence of parathyroid tissue. Pathologic diagnoses were also possible on abnormal parathyroid glands when the parathyroid imprint was used as a screening procedure to select specimens for frozen section. Accuracy and speed were excellent as used in this series of parathyroid surgical pathology consultations. Intraoperative imprint confirmation of parathyroid tissue is suggested as an improvement in pathologic consultation during parathyroid exploration. Owing to this, in our study, the surgeons sent us tissue for confirmation whether its parathyroid and if so, then it's a tumour too through frozen sectioning procedure.

Anton RC & Wheeler TM (2005)<sup>9</sup> concluded that the frozen section evaluation of thyroid and parathyroid lesions remains a highly accurate procedure with a low false-positive rate. Gross inspection, complemented by cytologic and histologic review, provides the surgeon with the rapid, reliable, cost-effective information necessary for optimum patient care. Thus this means that FS procedure results can be relied upon though its time consuming compared to intra-operative cytology smear evaluation.

Rohaizak M et al. (2005)<sup>10</sup> conducted a prospective study comparing cytology with frozen section in the intraoperative identification of parathyroid tissue. Intraoperative identification of parathyroid tissue is crucial during parathyroid surgery. Frozen section is the most common tool, but is time-consuming and expensive. Cytology study identified 25 of 29 parathyroid tissues, all three adipose tissues and one of two thyroid tissues. The remaining samples, four parathyroid tissues and one thyroid tissue, were not identified due to insufficient sample for diagnosis. The result translated to give a diagnostic accuracy of 88.2%, sensitivity of 86%, and specificity of 100%. All tissues were accurately identified by frozen section. They concluded that cytology is a rapid, economical test with acceptable sensitivity and high specificity. It can be used as an adjunct to frozen section and may be used as a tool in helping surgeons to identify parathyroid tissue. Our study supports the conclusion of the above study.

### IV. Conclusion

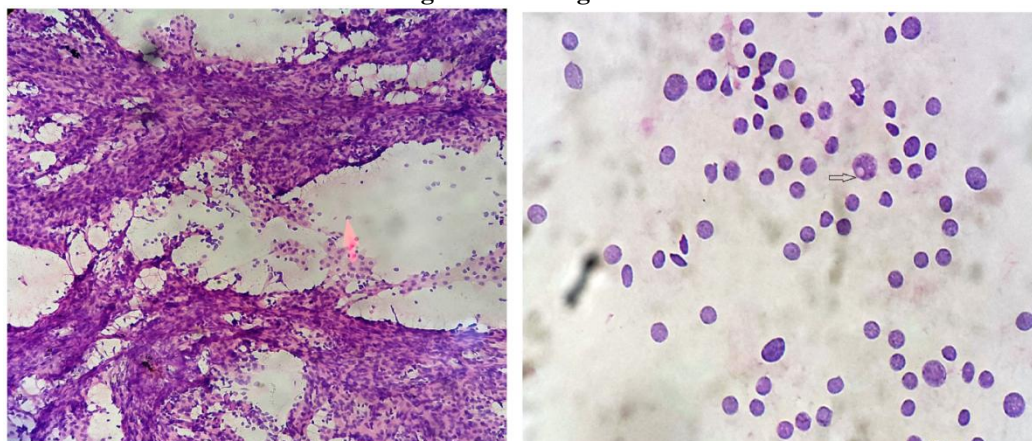
In our study, the time required for IC was 9 minutes and for FS was 18 minutes. We could correlate IC and FS findings for appropriate diagnosis. Routine preparation of cytology smears before freezing the tissue for intraoperative consultation during parathyroidectomy is important because once the tissue is frozen or put in formalin, the opportunity to prepare cytology smears is lost. As shown by the present study, a combined approach of IC and FS is preferable to using FS alone. In experienced hands, IC alone is better diagnostic tool than FS alone especially in a situation in which a small specimen is provided. The later may compromise FS quality, so it may be preferable to submit the tissue totally for IC. Also in developing countries like India, where adequate FS infrastructure may be lacking owing to economic or other reasons, a consideration should be given to using IC as an option.

### References

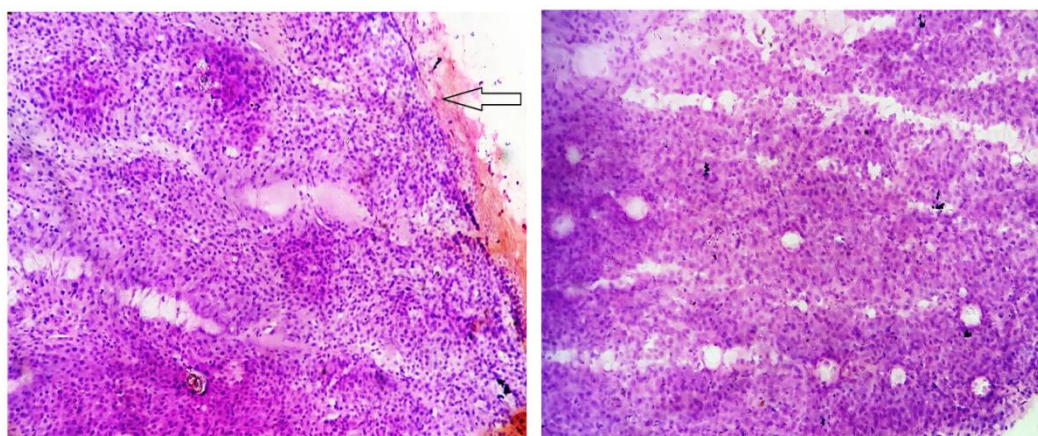
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**Figures with Legends:**



**Fig. 1:** Microphotograph from intra-operative cytological smears : Left image showing tumor cells arranged in papillary fragments with few clusters and disorganized sheets. Also arrow shows naked nuclei (H&E, x 100). Right image shows lymphoid-like cells. The cells are small with scant cytoplasm, round to oval nuclei with mild to moderate anisokaryosis. The nuclei were hyperchromatic, coarsely granular chromatin reminiscent of that of small lymphocytes. Naked nuclei were also noted without cytoplasm. Occasional nucleoli were seen. Arrow shows intra-nuclear cytoplasmic inclusion seen (H&E, x 400).



**Fig. 2:** Microphotograph from frozen sectioned and H&E smeared slides: Left image shows encapsulated (arrow), cellular, homogenous lesions composed of chief cells with some oxyphil cells with lack of normal adipose tissue (H&E, x 100).

Right image shows tumour is arranged in sheets with few thyroid-like microfollicles. Tumour cells are small with scant cytoplasm, round to oval nuclei with mild to moderate anisokaryosis. The nuclei were hyperchromatic, coarsely granular chromatin reminiscent of that of small lymphocytes with minimal mitotic activity (H&E, x 400).