



### Case study

## Study of Imprint Smears of various Thyroid Lesions with Histopathological Correlation

Authors

**Dr Pupul Bose, Dr Sandhya Bordia**

RNT Medical College, Udaipur

### Abstract

**Background:** *Imprint is a touch preparation in which tissue is touched on the slide and it leaves behind its imprint in the form of cells on glass slide; studies are made after proper staining.*

**Aims & Objective:** *(1) To evaluate utility of imprint smears as diagnostic modality;  
(2) To correlate the findings of imprint smears with histopathological findings.*

**Materials and Methods:** *This was a prospective study of 33 surgical specimens submitted in Department of Pathology, RNT, medical college, Udaipur. Smears obtained were stained with MGG Stain & studied.*

**Results:** *Out of total 33 cases of thyroid lesions, 29 were true benign, 03 cases were true malignant and 01 case was falsely diagnosed as benign.*

**Conclusion:** *Imprint smear is rapid technique for intraoperative diagnosis & can be utilized as an adjuvant to histological diagnosis.*

**Keywords:** *Imprint Smear, thyroid lesions, intraoperative diagnosis, adjuvant*

### Introduction

Imprint cytology is simple and rapid technique for tissue diagnosis. Imprint is a touch preparation in which tissue is touched on the slide and it leaves behind its imprint in the form of cells on glass slide; studies are made after proper staining. Diagnostic cytology is the science of interpretation of cells derived from human body, which either exfoliates freely from epithelial surface or removed from various sources by artificial means<sup>1</sup>.

A correct diagnosis helps in starting the specific therapy in time, thus reducing morbidity and mortality. Imprint cytology are now rapid diagnostic tool in the armamentarium of clinicians<sup>2</sup>.

Frozen section examination has its disadvantages and are not always able to detect the presence of capsular invasion and /or vascular invasion because freezing process can damage the tissue whereas imprint cytology can preserve cellular image (especially nucleus), including the capsular invasion and /or vascular invasion.

Thyroid gland is the largest endocrine gland of the body. Pathologic lesions of varied morphology affect the thyroid. These lesions may cause diffuse or nodular enlargement of the thyroid. Diffuse thyroid enlargement are mostly associated with non-neoplastic lesions whereas nodular enlargement includes non-neoplastic as well as benign and malignant lesions<sup>3</sup>.

Thyroid diseases can be divided into three groups: inflammatory (thyroiditis), hyperlastic (nodular goiters and Grave's disease), and neoplastic diseases. A thyroid nodule is a palpable swelling in a thyroid gland with an otherwise normal appearance. Thyroid nodules are common and may be caused by a variety of thyroid disorders. While most are benign, about 5 percent of all palpable nodules are malignant<sup>4</sup>.

### Method and Material

This study was carried out on various surgical specimens of thyroid submitted in Department of Pathology, Rabindranath Tagore Medical College, Udaipur, Rajasthan, with 33 patients during a period of 2 years from December 2014 to December 2016.

Materials required were new blade, clear glass slides, glass marking pencil, 95% alcohol, dry gauze/ cotton. In each case we made a naked eye diagnosis from the excised specimen before examining imprint cytology. After surgical removal, the lump was thoroughly inspected and palpated and then it was bisected. A diagnosis of it being benign or malignant was recorded.

The imprints were prepared according to the technique described by Tribe<sup>5</sup> (1973)-

- 1) Slides were properly labeled by using glass marking pencil.
- 2) After sectioning the areas suggestive of disease were gently touched with dry gauze to remove blood on the surface
- 3) Slides were then gently touched on the freshly cut surface of the specimen, avoiding a gliding movement. Pressure applied for imprinting varied with the consistency of the specimen.
- 4) Smears were quickly fixed in 95% alcohol in order to avoid air drying artifact and stained with MGG.

Screening was done under low power of microscope and appropriate areas were seen under high power for malignant and other changes.

Paraffin blocks were made accordingly and sections were cut on microtome. The routine

haematoxylin and eosin staining was used for histopathological study of the specimens.

### Result

Majority of the patients were adults of middle age group in the range of 30-39 years (36.36%), followed by patients of the age group of 40-49 years (30.30%), 24.24% were elderly patients (50-60 years) and only 03 patients were in 20-29 years age group. The study revealed a female predominance with male to female ratio being 1:4.5.

On imprint cytology a total of 12 cases were diagnosed as colloid goiter followed by 10 cases of follicular neoplasms, 08 cases were of Hashimoto thyroiditis and 03 cases were diagnosed as Papillary carcinoma thyroid.

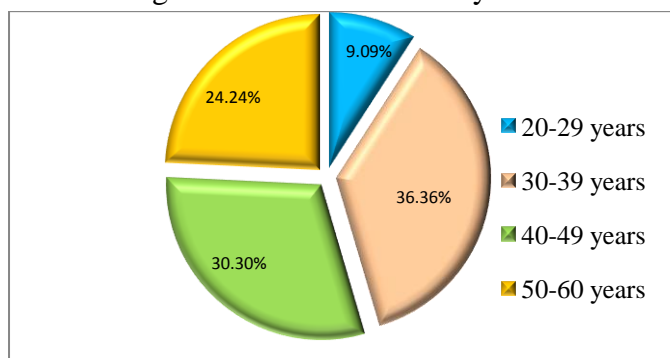
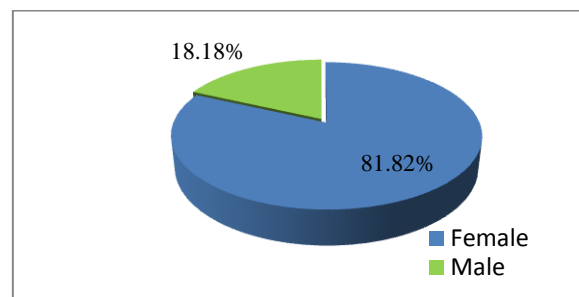
All the diagnoses made through imprint cytology technique were compared and correlated with histopathology, considering later to be the standard gold method.

Out of the total 33 cases, 14 cases were of colloid goiter contributing (42.42 %), a total of 08 cases were diagnosed as follicular adenoma (27.27%), followed by Hashimoto thyroiditis being diagnosed in 06 cases (18.18%). Papillary carcinoma was diagnosed in 03 cases (9.09%). Follicular carcinoma was diagnosed in only 01 case (03.03%).

Overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy for the imprint cytology in diagnosing malignant lesion came out to be 75 %, 100%, 100%, 96.67% and 96.97% respectively.

**Table 1:** Age wise distribution of thyroid lesions

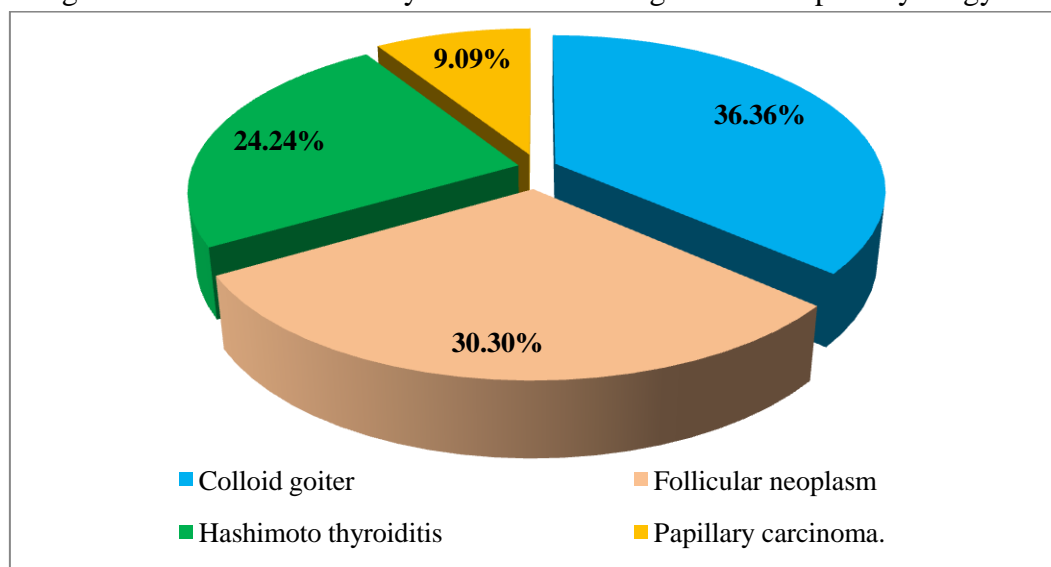
AGE group	No.	%
20-29 years	3	9.09%
30-39 years	12	36.36%
40-49 years	10	30.30%
50-60 years	8	24.24%
<b>Total</b>	<b>33</b>	<b>100%</b>

**Chart 1-** Age wise distribution of thyroid lesions**Chart 2:** Showing distribution of thyroid lesions in both the sexes**Table-2:** Sex wise distribution of thyroid lesions

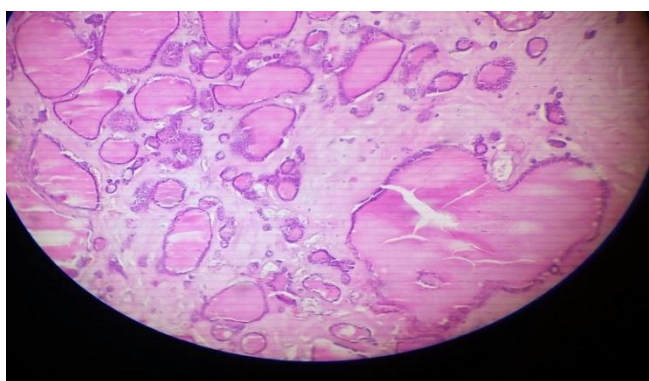
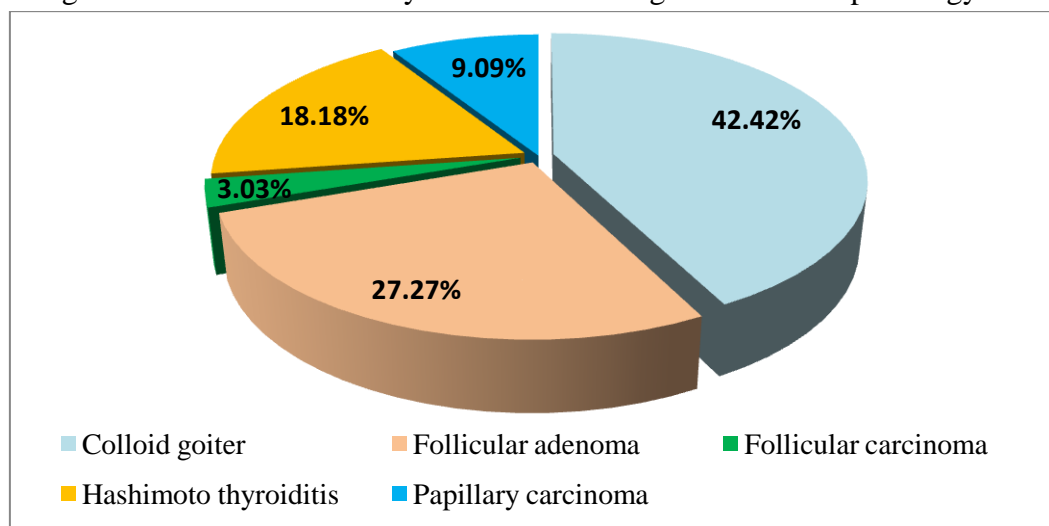
Sex	No.	%
Female	27	81.82%
Male	6	18.18%
<b>Total</b>	<b>33</b>	<b>100%</b>

**Table-03:** Various diagnoses as made in imprint smears

IMPRINT	No.	%
Colloid goiter	12	36.36%
Follicular neoplasm	10	30.30%
Hashimoto thyroiditis	8	24.24%
Papillary carcinoma.	3	9.09%
<b>Grand Total</b>	<b>33</b>	<b>100.00%</b>

**Chart 3:** Showing distribution of various thyroid lesions as diagnosed in imprint cytology**Table-04:** Various thyroid lesions as diagnosed on histopathology examination

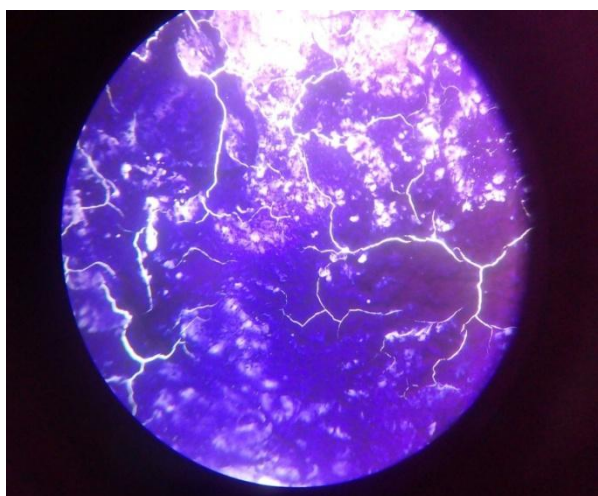
BIOPSY	No.	%
Colloid goiter	14	42.42%
Follicular adenoma	9	27.27%
Follicular carcinoma	1	3.03%
Hashimoto thyroiditis	6	18.18%
Papillary carcinoma	3	9.09%
<b>Grand Total</b>	<b>33</b>	<b>100%</b>

**Chart 4:** Showing distribution of various thyroid lesions as diagnosed on histopathology examination

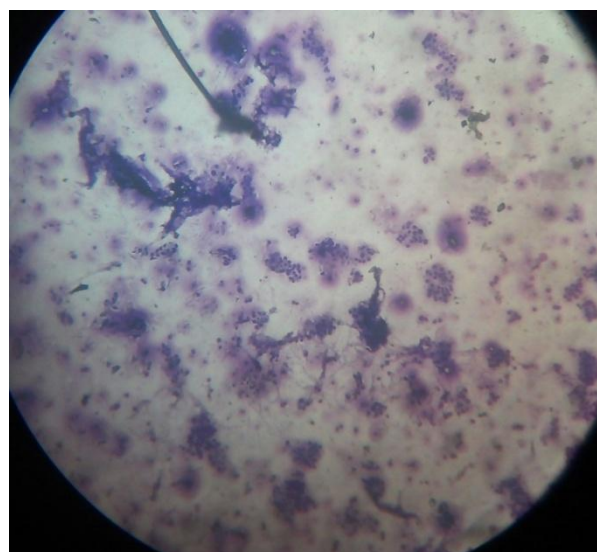
**Figure 1** Colloid goiter-imprint smear closely mimicking the appearance of colloid goiter as seen in biopsy with presence of follicles of varying sizes having lined by crowded columnar cells, piling at places to form projections. Follicular lumens are filled with eosinophilic colloid. (MGG;X100)



**Figure 2** Follicular adenoma-Follicular epithelial cells forming micro-follicular and rosette like patterns in a repetitive manner. (MGG;X100).

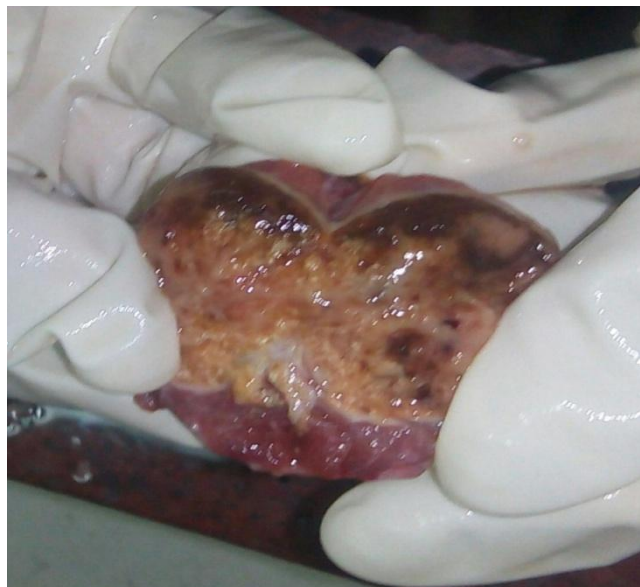


**Figure 2** Abundant colloid showing cracking artifacts (MGG;X100)

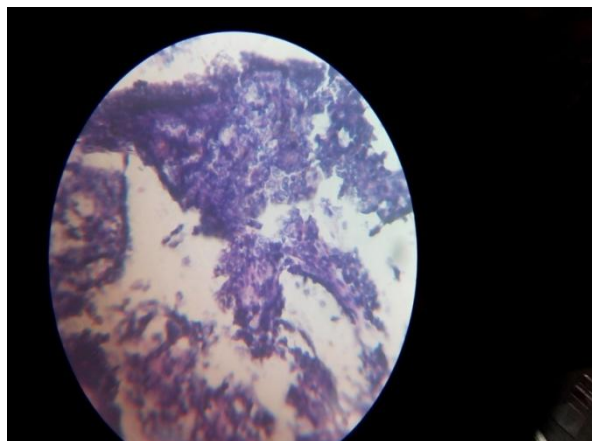


**Figure 4** Gross photo of a fresh encapsulated specimen removed by hemithyroidectomy.





**Figure 3** Papillary carcinoma-Cut surface showing minute papillary projections and hemorrhage at the periphery of the resected gland.



**Figure 4** Papillary carcinoma-flat sheet of epithelial cells having nuclear over lapping, uniformly enlarged oval nuclei with pale powdery chromatin and nuclear grooving. (MGG;X400).

### Discussion

In the present study mean age was 39.84 years which is close to the mean age in the study of Rangaswamy M et al (40.57years)<sup>6</sup>. In the various other studies of Aahna Gupta et al<sup>7</sup> and Singh P et al<sup>8</sup> mean age was 37.49 years and 47 years respectively.

Majority of the patients in this study were in the range of 30-39 years (36.36%). In the study of Jimmy Antony et al<sup>9</sup> patients were in the age group of 40-60 years (40.80%). It was 21-40 years (51%) in the study of Aahana Gupta et al. It was

12 – 80 years in the study of Singh P et al and 21-40 years in the study of Islam et al<sup>10</sup> and 11- 70 years in the study of Rangaswamy M et al.

In our study female patients were more affected with male to female ratio being 1:4.5 which is close to the study by Singh P et al (1:4.7), Sangali G et al<sup>11</sup> (1:4.21) and Mandal S et al<sup>12</sup> (1:5).

Female preponderance for thyroid lesions is owing to the fact that thyroid tissue has estrogen receptors<sup>13</sup>.

In our study overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy came out to be 75%, 100%, 100%, 96.67% and 96.97% respectively. Francis et al<sup>14</sup> found sensitivity, specificity and accuracy to be 85%, 100% and 71.15% respectively. In the study of Pustaka et al<sup>15</sup> sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 84.2%, 95.45%, 94.12%, 87.50% and 90.24% respectively.

In the study by Taneri et al<sup>16</sup>, sensitivity, specificity and accuracy were 83.3%, 97.7% and 96% respectively. In the study of Mutaharra et al<sup>17</sup>, sensitivity, specificity and accuracy were 84%, 93.07% and 96% respectively.

Sukumar shaha et al<sup>18</sup> found sensitivity, specificity, positive predictive value and accuracy to be 66.66%, 82.59%, 87.12% and 81.25% respectively.

In comparison to all the above mentioned studies, results of the present study are higher for all the parameters.

### Conclusion

The present study successfully reinforces the role of imprint cytology in the intra operative diagnosis of various lesions of thyroid especially in the setting where frozen section method is unavailable.

All the 03 cases of papillary carcinoma were successfully diagnosed in imprint cytology owing to the striking details of the nuclei as evident in imprint smears. Unlike the frozen section, technique used for imprint cytology smear preparation does not introduce artifacts in the

specimen resulting in superb nuclear and cytoplasmic details. One more advantage with imprint cytology is that tissue which cannot be studied by frozen section like necrotic tissue, bone and fat, etc. give accurate results on imprint cytology. However capsular and vascular invasion were difficult to be determined and hence follicular carcinoma was missed. The other disadvantage with imprint cytology was difficulty in assessing the depth of the tissue involved which is important in the context of effective surgical excision of the tumor.

A few suggestions that can be applied in the method of imprint cytology for a better and easy evaluation are as follows –

- 1) The tissue surface to be imprinted should be flat and there should be no portion of fat protruding from the edges as these tend to smudge the imprints.
- 2) Sometimes the first imprint contained excess tissue fluid and blood and it was found that subsequent imprints gave better cytological results and third smear was found to be the best.
- 3) The case with which any tumor gets imprinted varies considerably. In order to obtain imprint nearest to one cell thickness, the amount of pressure applied at the time of imprinting therefore varied. Benign looking lesions usually required more pressure in order to obtain sufficient cells for diagnosis while malignant tumors get imprinted more easily.

In the future with application of immunohistochemistry, special stains and cytometric nuclear DNA analysis may improve the sensitivity, accuracy and speed of imprint cytological diagnoses.

### Acknowledgment

I would like to express my gratitude to Dr. Sandhya Bordia, Professor of Pathology, RNT Medical College, Udaipur, Rajasthan, India for her valuable advices during the conduct of the study.

### References

1. Bal MS, Kahlon SK, Bidani R. Comparative evaluation of aspiration cytology and preoperative imprint cytology in breast lesions. *J of Cytology* 2000;17:27-32
2. Vemuganti GK, Naik MN, Honavar SG, Sekhar GC. Rapid intraoperative diagnosis of tumors of the eye and orbit by squash and imprint cytology. *Ophthalmology* 111; 1009-15, 2004.
3. LiVolsi VA: Postpartum thyroiditis: the pathology slowly unravels [editorial]. *Am J Clin Pathol* ; 100:193-195,1973
4. Welker M., Orlov D. Thyroid nodules. *American Family Physician*. 67 (3): 120-125, 2003.
5. Tribe CR. A comparison of rapid methods including imprint cytodagnosis for the diagnosis of breast tumors. *J Clin Pathol*; 26: 273–7, 1973.
6. Rangaswamy M ,Narendra KL,Patel S, Guruprasad C, Manjunath GV; Insight to neoplastic thyroid lesion by fine needle aspiration cytology.*J Cytol*.2013;30(1):23
7. Aahana Gupta ,Durga Shankar, Jaipal, Sunita Kulhari, Neelu Gupta; Histopathological study of thyroid lesions and correlation with ultrasonography and thyroid profile in Western Zone of Rajasthan .*International Journal of Research in Medical Sciences*.
8. Singh P,Chopra R,Calton N,Kapoor R.Diagnostic Accuracy of Fine Needle Aspiration Cytology of Thyroid Lesion. *Journal of Cytology*, 2000;17(3);135-9.
9. Jimmy Antony, T M Celine ,Michale Chacko. Spectrum of thyroid disorders :A retrospective study at a medical college hospital.2014;11(2);55-59.
10. Islam R,Ekramuddaula AFM ,Alam MS,Kabir MS,Hossain D, Alauddin M.Frequency and pattern of malignancy in solitary thyroid nodule.*Bangladesh J of otorhinology* .2009;15(1):1-5.

11. Sangali G, Sergio G, Zampatti C, Bellotti M, Lomuscio G. Fine needle aspiration cytology of the thyroid :A comparison of 5469 cytological and final histological diagnosis . Cytopathology 2006;17(5):245-50.
12. Mandal S , Barman D , Mukherjee A, Saha J, Sinha R .Fine needle aspiration cytology of thyroid nodules ,evaluation of its role in diagnosis and management .J Indian Medical Association .2011;109(4):258-61.
13. Krukowski ZH. The thyroid gland and thyroglossal tract .In: Williams. NS, Bulstrode CJK, O'Connell PR eds. Baily and Love's short practice of surgery 24<sup>th</sup> ed .London.Hodder education .2004:776-804.
14. Francis IM, Das DK. Role of FNA, intraoperative cytology and frozen section in the diagnosis of breast lumps and thyroid lesions. Int J Kuwait Univ Health Sci Cent ;8:173-82,1999.
15. Pustaka, I.G N, Sudarsa, I W, and Golden, N Diagnostic validity of cytological imprint in thyroid follicular neoplasm .Bali Medical Journal (BMJ) 2013, Volume 2, Number 3: 113-116 P –ISSN . 2089-1180,E-ISSN.2302-2914.
16. Taneri F., Poyraz A., Salman B., Tekin E., Onuk E. 'Using imprint and frozen section in determining strategies for thyroid pathologies.' Endocrine regulations. 35:71-75,2001.
17. Mutaharra H.A., Deva W., Wani K.A., Wani N.A., Shah A., Malik A.A, Imprint cytology versus frozen section in the intraoperative diagnosis of thyroid swellings, JK practitioner. 8 (1): 27-29,2001.
18. Sukumar Shaha ,AJENahar Rahman. Comparative Study of imprint cytology and frozen section in the intraoperative diagnosis of thyroid lesions .Bangladesh S Pathol ;24:12-15,2009.