

C. T. Guided Fine Needle Aspiration Cytology of Solitary Lung Lesions: Cytological Versus Histological Correlation

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Abstract

Background and objectives: Lung cancer is the most frequent and one of the most deadly cancer types with an incidence of 1.8 million cases per year. The present study was done to know the cytomorphological diversity of localised lung lesions and its correlation with histological findings.

Materials and Methods: A study was conducted over a period of one year from August 2017 to July 2018 in the Department of Pathology and Department of Radiodiagnosis in Indira Gandhi Institute of Medical Sciences, Patna. Computed tomography (CT) guided fine needle aspiration cytology (FNAC) was carried out, and aspirates were drawn, examined, and compared with their histological diagnoses.

Results: A total of 58 cases presented as solitary lung masses out of which 56 cases (96.5%) were consistent with malignancy, and 2 cases (3.4%) benign on clinical and radiological evaluation. On cytological evaluation of 58 cases, 55 cases (94.8%) were considered malignant, 2 (3.4%) of them benign and 1 cases (1.7%) were inadequate for diagnosis. The diagnostic adequacy in current series is 98.27%. By cytology, the most common malignant lesion was adenocarcinoma (42.1%) followed by squamous cell carcinoma (24.5%), non small cell carcinoma (10.5%) adenosquamous carcinoma (5.2%), and lymphoid neoplasm (5.2%). Out of the 58 cases in which cytological evaluation was done, biopsy was performed in 43 cases. Histopathological findings were concordant with cytomorphological findings in most of the cases.

Conclusion: CT guided FNA of lung lesions is a simple, safe, economically prudent technique associated with low morbidity and leading to quick and early diagnosis even in cases where biopsy is not feasible.

Keywords: Lung carcinoma, Solitary lesion, Metastatic deposit, CT guided FNAC.

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I. Introduction

Worldwide, lung cancer is the most-common cancer among men in terms of both incidence and mortality, and among women has the third-highest incidence, and in mortality it is second after breast cancer.¹ The most common age of presentation is 70 years. Overall, 17.4% of diagnosed case of lung cancer in united states, survive five years after the diagnosis.

Metastasis and wide spread extension is common by the time of diagnosis and is associated with a poor outcome. Fine needle aspiration cytology (FNAC) has a great role in diagnosing lung carcinoma which are not amenable for surgical excision and early diagnosis by FNAC will greatly influence of the survival rate as treatment can be started immediately. Although clinical data, location, and radiological findings can reduce the diagnostic possibilities, cytological diagnosis is needed before initiating the specific treatment.² CT-guided fine needle aspiration cytology (FNAC) is considered to be the first choice for the initial investigation and diagnosis of superficial as well as deep lesions, especially in lesions which are in pulmonary apex, upper lobe, medial lobe and periphery, particularly small lesions (one centimeter or so in diameter).³

One of the major advantages of FNAC is the diagnosis and typing of tumor type like small cell carcinoma and lymphoma which can be treated by chemotherapy rather than surgery. Nowadays, CT guidance is practiced widely because it is a safe, less time consuming and day care procedure.⁴

Recently, the 2015 world health organization (WHO) classification of lung tumors is the first WHO classification to provide standardized criteria and terminology for lung cancer diagnosis in small biopsies and cytology.⁵ There are no major changes in the terminology or diagnostic criteria for lung tumors since the 2004 Classification.⁵

II. Aims & Objectives

1. To study the cytological characteristics of various solitary lung lesions subjected to FNAC and its correlation with histopathological findings.
2. To study the adequacy of aspirates obtained from localised lung lesions by fine needle aspiration under C.T. guidance.
3. To study the complications consequent upon the procedure.
4. To study the various problems encountered in cytodagnosis of these aspirates.

III. Material And Methods

A study was conducted over a period of one year from August 2017 to July 2018 in the Department of Pathology and Department of Radiodiagnosis in Indira Gandhi Institute of Medical Sciences, Patna. Aspiration smears from the cases of solitary lung lesions aspirated under computed tomography guidance were received in the cytology section of department of pathology for cytological evaluation. Cases of solitary lung lesions were only included in the study.

Plain and contrast CT of chest was done as an out patient procedure after explaining the risks and benefits and obtaining informed consent. First, an axial scan of area of interest only, was done to locate the lesion. After cleaning and draping, local anaesthetic (2% xylocaine) was infiltrated at the site of puncture. A 22 – 23 gauge spinal needle was then inserted during suspended respiration, directing the tip of the needle towards the lesion. The stylet was then withdrawn 2 – 3 cm and the needle was then advanced into the mass. With the help of 20 ml syringe, aspiration was done.

The aspirated material was expelled into the clean glass slides and smears were prepared. Air dried smears were fixed in methanol for 20–30 minutes and then stained with May – Grunwald Giemsa stain. After drying the smears were mounted with DPX and then evaluated under the microscope. Bleeding disorder was one absolute contraindication in the selection of patient.

In peripherally located lesions, CT guided core biopsy was performed under local anaesthesia before the FNAC was done. Subsequently core biopsy specimens were histopathologically evaluated. Immunohistochemistry was done in few selected cases.

IV. Results

A total of 58 fine needle aspiration smears from the cases of localised lung lesions aspirated under computed tomography guidance were received in the cytology section of department of pathology for cytological evaluation.

A total of 58 aspirates were performed, out of which 47 (81.03%) were males and 11 (18.96%) were females.

The age of the patients in the present study varied from 26 years to 87 years. 9 Groups were made from 0 – 10 years to 81 – 90 years. (Table I)

Table I: DISTRIBUTION OF CASES ACCORDING TO AGE AND CYTOLOGICAL DIAGNOSIS IN VARIOUS AGE GROUPS (n=58)

S. No.	Age Group	No. of Cases	Various Lesions – Diagnosed	%
1.	0 – 10	00	-	0.0
2.	11 – 20	00	-	0.0
3.	21 – 30	01	Adenocarcinoma	1.72
4.	31 – 40	02	NH – SRCT*, Adenocarcinoma	3.44
5.	41 – 50	08	Granulomatous inflammation, Adenocarcinoma, SCC**, Sq CC, Mets-adenocarcinoma	13.79
6.	51 – 60	23	Adenocarcinoma, NHL, Sq, CC, ASqC, GCC***, NSCC, Granulomatous inflammation	39.65
7.	61 – 70	13	Sq, CC, Adenocarcinoma, ASqC, NSCC	22.41
8.	71 – 80	09	Sq, CC, Adenocarcinoma, ASqC, Adenocarcinoma with lepidic pattern,	15.51
9.	81 – 90	02	Adenocarcinoma, inadequate, SqCC	3.44
	TOTAL	58		100.0

** SCC: Small Cell Carcinoma, * NH – SRCT: Non-hematolymphoid small round cell tumor, ***GCC: Giant Cell Carcinoma Sq CC: Squamous cell carcinoma, ASqC: Adenosquamous carcinoma, NSCC- Non small cell carcinoma

Of these 58 cases, 2 cases (3.44%) were benign and the diagnosis of granulomatous inflammation was made. Tuberculous bacilli were detected in one of the benign cases. The maximum number of 23 cases (39.65%) lay in the age group of 51 – 60 years, followed by 13 cases (22.41%) in the age group of 61 – 70 years.

Adequacy

The aspirates were considered adequate if the cytology material were sufficient for rendering the diagnosis. Out of 58 cases, only one case (1.72%) was inadequate and comprises of predominantly haemorrhagic smear with occasional carbon laden macrophages. In rest of the cases (98.27%) specific cytological diagnosis were made.

Cytological diagnosis

Amongst 57 cases which were adequate for cytological diagnosis on fine needle aspiration was:- (Table II)

1. Non neoplastic cases – 02 (3.5%)
2. Neoplastic (all malignant) cases – 55 (96.49%)

Table II: DISTRIBUTION OF CASES ACCORDING TO CYTOLOGICAL DIAGNOSIS (n =57)

S. No.	Cytological Diagnosis	No. of Cases	%
1.	Non Neoplastic (Granulomatous inflammation)	2	3.5
2.	Neoplastic		
	a. Benign	0	0.0
	b. Malignant		
	i. Squamous cell carcinoma	14	24.56
	ii. Small cell carcinoma	2	3.50
	iii. Adenocarcinoma		
	• Conventional	23	40.35
	• Adenocarcinoma with lepidic pattern	1	1.75
	v. Adenosquamous carcinoma	3	5.26
	vi. Giant cell carcinoma	1	1.75
	vii. Lymphoid Neoplasm	3	5.26
	ix. Non - Hematolymphoid small round cell tumor	1	1.75
	x. Metastatic Adenocarcinoma	1	1.75
	xi. Non small cell carcinoma	6	10.52
	TOTAL	57	100.0

Squamous cell carcinoma - Ragged cluster margin, irregular angular, hyperchromatic nucleus, evidence of keratinization, necrotic background variably.(Fig. 1)

Adenocarcinoma – medium sized to large cells with abundant cytoplasm, sheets, rosettes and acinar groupings, round to oval nuclei, prominent nucleoli, clean or mucinous background.(Fig. 2)

Adenocarcinoma with lepidic pattern – large cohesive monolayered sheets, papillae, cell balls and clusters, intra-nuclear cytoplasmic inclusions and grooving.

Small cell carcinoma – small to medium sized cells having finely or coarsely granular chromatin and nuclear moulding. (Fig. 3)

Giant cell carcinoma – Numerous multinucleated neoplastic giant cells, neutrophilic emperipolesis and necrotic inflammatory background.

Adenosquamous Carcinoma – Features of both glandular as well as squamous differentiation.(Fig. 4)

Metastatic renal cell carcinoma – cells with abundant granular to clear cytoplasm, rounded nuclei, variable anisokaryosis and macronucleoli.

Non small cell carcinoma – cell clusters having round to oval medium sized cells, inconspicuous to prominent nucleoli.

Histopathological correlation was possible in 43 cases. Histopathological study was particularly helpful where cytology was unable to clearly categorize the non small cell carcinomas. The diagnoses in these cases were made as non small cell carcinoma suggestive of either squamous cell carcinoma (4 cases) or adenocarcinoma (2 cases). On biopsy examination, 4 cases were confirmed to be squamous cell carcinoma (Fig. 5) and 1 cases confirmed adenocarcinoma. 1 case, reported on cytology as suggestive of adenocarcinoma was histologically diagnosed as squamous carcinoma. In case of small cell carcinoma, both cases were proven histologically (Fig.6). Other cases showed concordance with cytological diagnosis. (Table III).

TABLE III: CORRELATION BETWEEN CYTOLOGY & HISTOLOGY (n=43)

Cytological diagnosis	No of cases	Histological concordance	Histological discordance
Squamous cell carcinoma	13	12	1
Adenocarcinoma	20	19	1
Small cell carcinoma	2	2	0
Non small cell carcinoma suggestive of squamous cell carcinoma	4	4	0
Non small cell carcinoma suggestive of adenocarcinoma	2	1	1
Non Hodgkin's lymphoma	2	2	0

V. Discussion

In the present study, a total of 58 cases presented as solitary lung masses out of which 56(96.5%) were consistent with malignancy, and 2 cases (3.4%) benign on clinical and radiological evaluation. On cytological evaluation of 58 cases, only 55 cases (94.8%) were considered malignant, 2 (3.4%) of them benign and 1case (1.7%) was inadequate for diagnosis.

In the present study, all the cases were adults with peak incidence of 51-60 years and as documented in studies by Saha et al in 57 cases³, Shah et al in 100 cases⁶ and Basnet et al⁷ in 100 patients. All the patients were above 20 yrs of age.^{3,6,7,8}

Present study shows male preponderance of 81.03%. Similar incidence were found in studies by Saha et al (78.9%)³, Shah et al (88%)⁶, Bandyopadhyay et al (80.6%)⁹. Smoking habits and occupational hazards are the prime factors responsible for greater incidence in males.

The adequacy rate in the present series is 98.27%, the values were very near to the values of Madan M. et al(95.0%)¹⁰, Sarker R. N. et al (95.0%)¹¹ and Rangaswamy M. et al (96.3%)¹². Literature review suggests diagnostic yield ranging from 44% to 96.3% when fine needle aspiration cytology was combined with imaging modalities.

In the present study, lesions were divided into non-malignant which accounted for 2 of 58 cases (3.4%) and malignant lesions, which accounted for 55 of 58 cases (94.8%). According to review of literature distribution of benign and malignant lesions in the literature varied from, 7.8% - 37.8% for benign cases and 62.2% - 96.3% for malignant cases. Our results were very near to the study of Shaheen M.Z. et al¹³ and Yilmaz A. et al.¹⁴

Amongst the lung masses in our series, maximum cases were diagnosed as adenocarcinoma (42.1%), which was very close to the figures, quoted by Geraghty P. R. et al (45.6%)¹⁵ and Gangopadhyay M. et al (54.2%).¹⁶

Of all the major types of lung carcinomas, small cell carcinoma was diagnosed very less (3.5%) in the current study. However, small cell lung carcinoma accounts for about 20% of all lung cancers.¹ Review of the cytologic literature reveals frequencies ranging from 1.5% (Ahmed S. et al)¹⁷ to 34.1% (Laurent F. et al).¹⁸ This is probably due to the fact that most cases of small cell lung carcinoma have extrathoracic metastasis at the time of diagnosis and can thus be diagnosed by aspiration from more accessible sites, for example supraclavicular lymph nodes, thus obviating the need for sampling the lung.

The cytodiagnosis on lung FNAC was conclusive of malignancy; hence biopsies from lung were not undertaken in each and every case. However in 43 cases, biopsy from the lung or cervical/ supraclavicular lymph nodes were available for histological correlation. The present study showed high degree of agreement between cytological diagnosis with that of histological diagnosis.

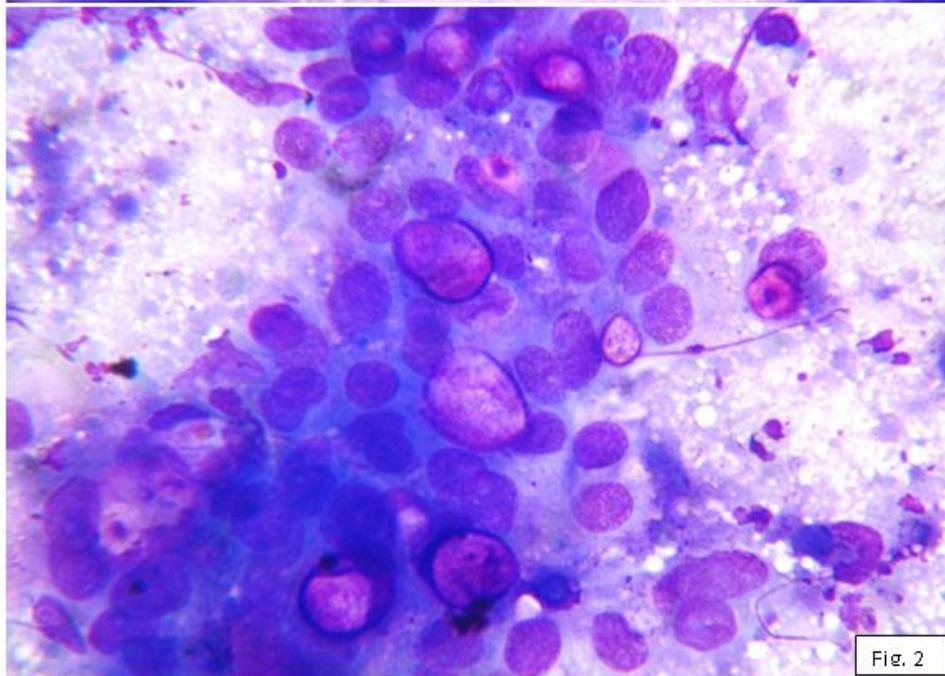
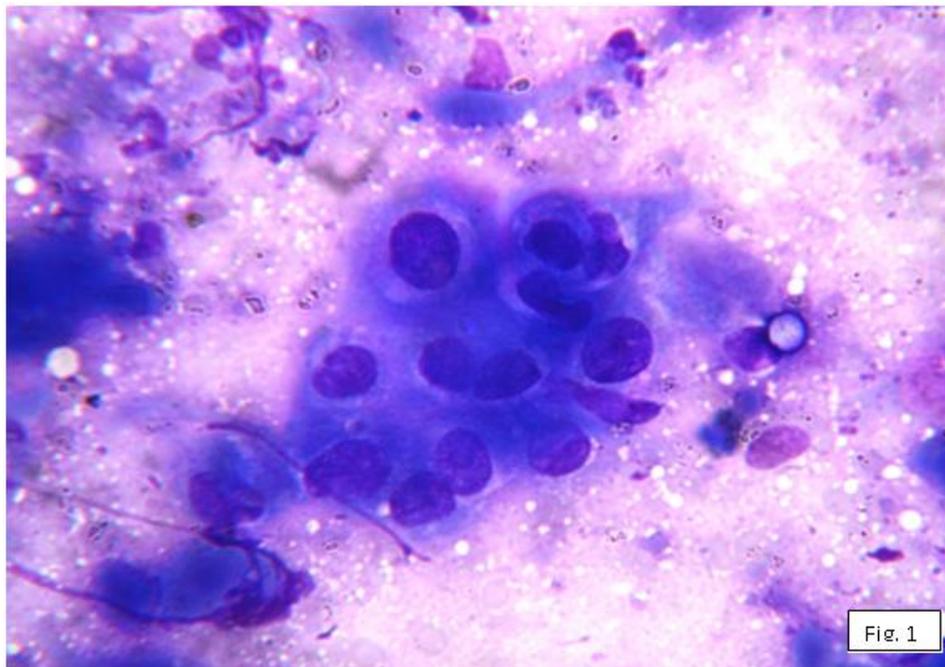
VI. Conclusion

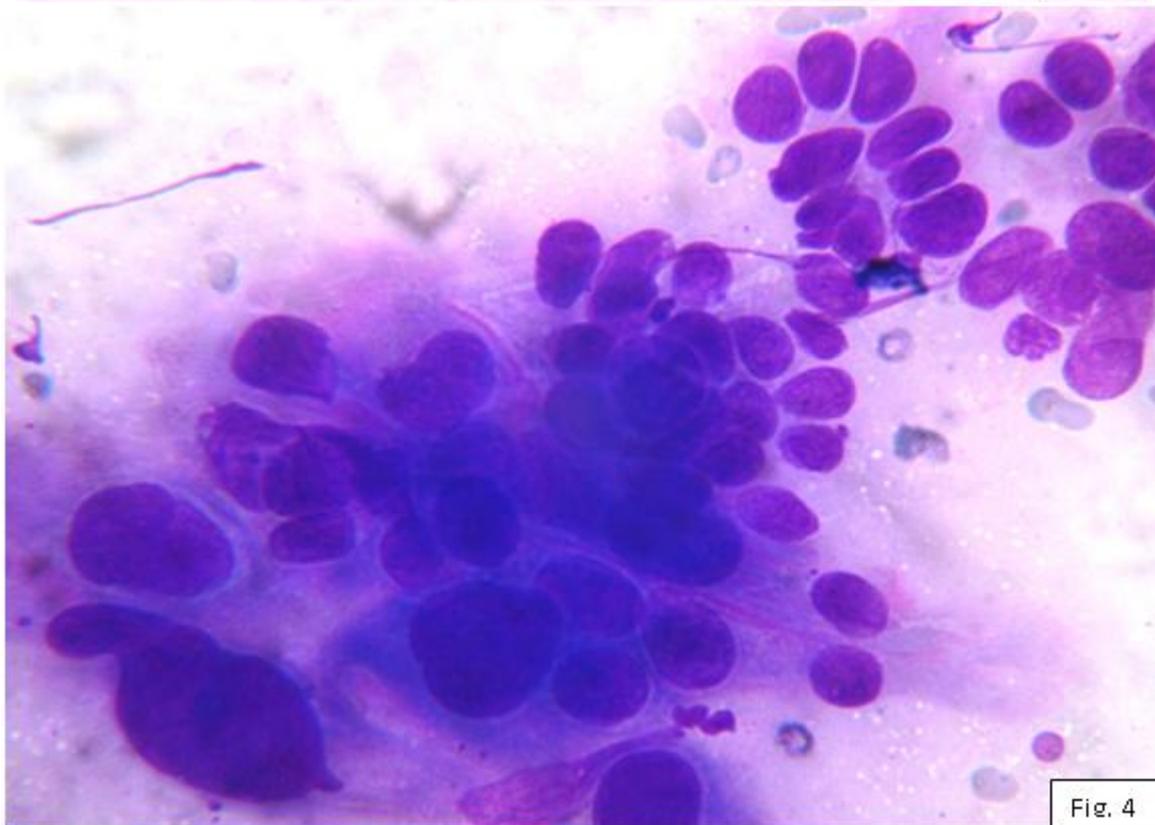
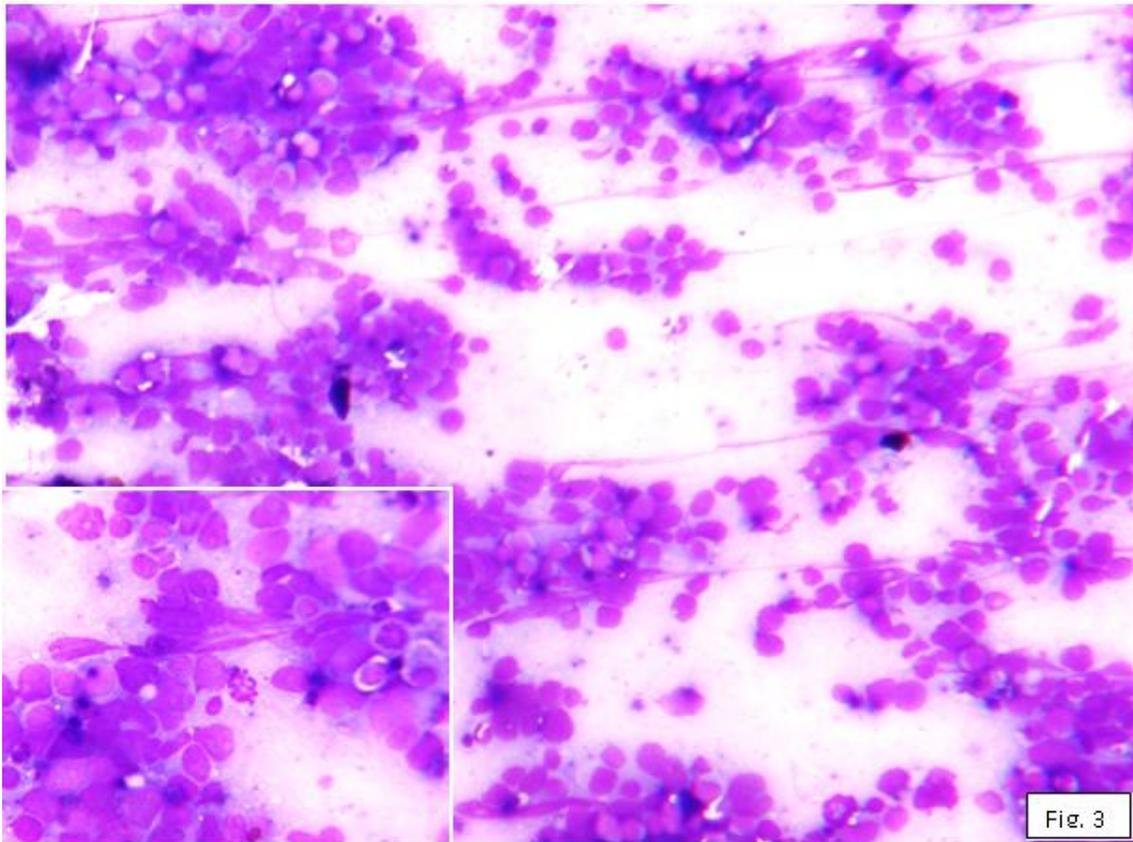
C.T. guided FNAC of solitary lung lesions is an extremely beneficial procedure which furnishes adequate and diagnostic material in the vast majority of subjects without significant complications. Cytodiagnosis alone can be accurate in differentiating histological variants of lung tumour and starting management.

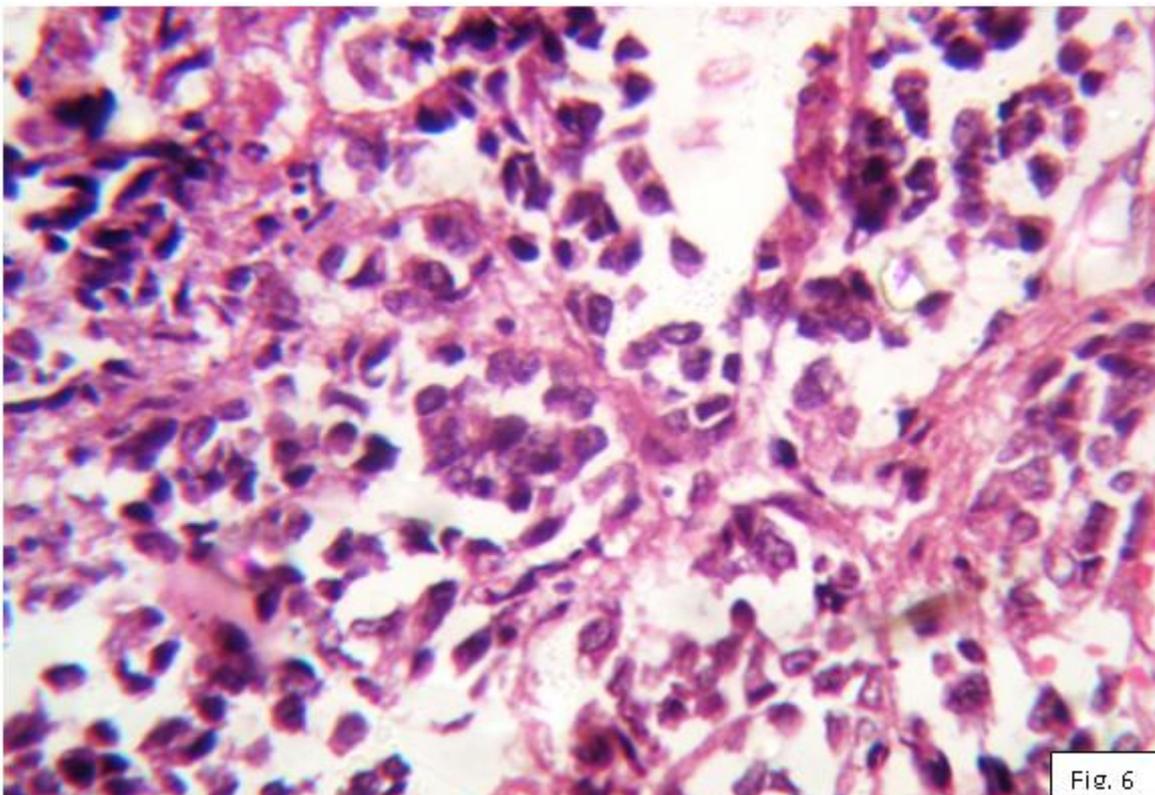
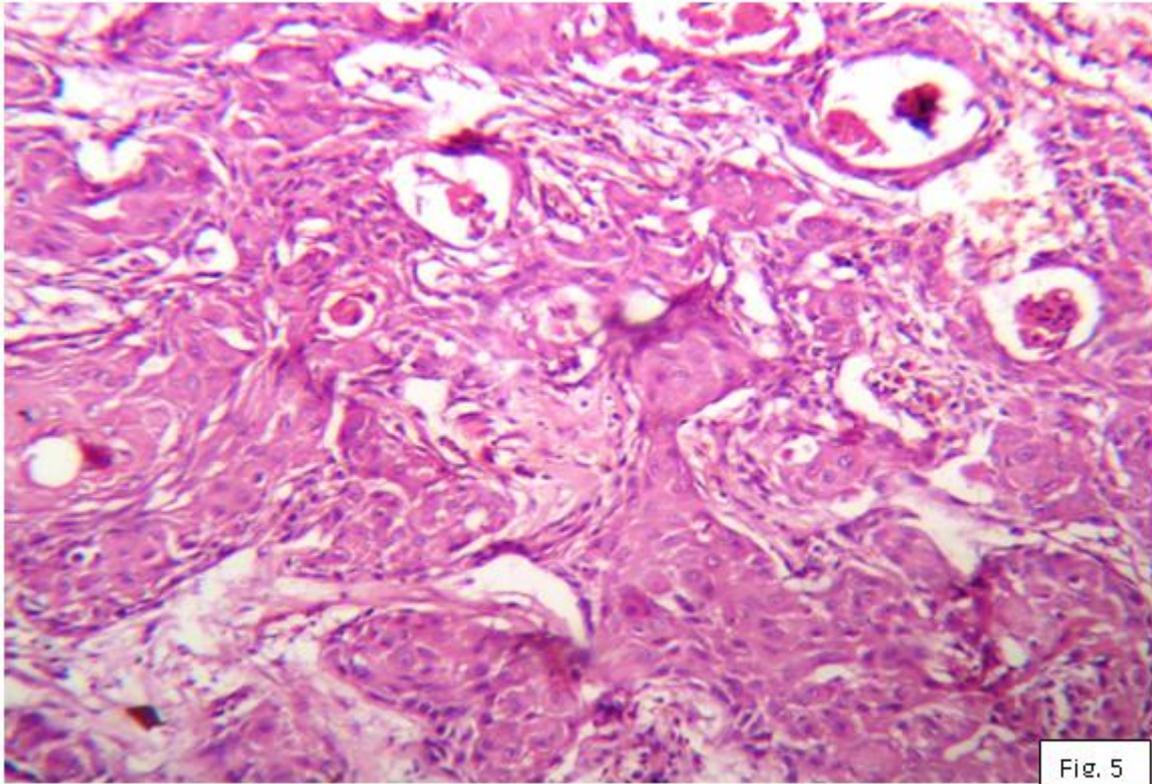
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Legends:

Fig. 1 – Photomicrograph showing moderately differentiated keratinizing squamous cell carcinoma (MGG, 10X40).

Fig. 2 – Photomicrograph showing adenocarcinoma : intracellular mucin in a necrotic background (MGG, 10X40).

Fig. 3 - Photomicrograph showing small cell carcinoma : loosely cohesive to dispersed small cells with scanty/ absent cytoplasm, nuclear moulding and apoptotic bodies (MGG, 10X10). Inset shows image in high power

Fig. 4 - Photomicrograph showing adenosquamous carcinoma: dual differentiation (MGG, 10X40).

Fig. 5 - Photomicrograph showing well differentiated squamous cell carcinoma (H&E, 10X40)

Fig. 6 – Photomicrograph showing small cell carcinoma: small cells with scanty/ absent cytoplasm and nuclear moulding (H&E, 10X40)

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