

The Utilisation of Fine Needle Aspiration Cytology for Diagnosis of Head and Neck Lesions in Paediatric Age Group

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Date of Submission: 15/02/2024

Date of Review: 28/02/2024

Date of Acceptance: 12/03/2024

ABSTRACT

Introduction: Fine needle aspiration cytology of head and neck region is well-accepted as a diagnostic procedure. It is a safe, simple, rapid, cost-effective, and minimally invasive way of diagnosing inflammatory, noninflammatory and neoplastic lesions. Aim : To study the role of FNAC in diagnosing head & neck lesions in the paediatric age group.

Material and Method: This is the hospital-based study of 120 lesions of the head and neck region belonging to the age group of 0-18 years. Cytological results are interpreted and analyzed according to anatomical site and then categorized based on interpretation.

Result: Out of 120 cases 20 % cases belong to the age group 0-5yrs, 24.16% belong to 6-10yrs & 55.83% belong to the 11-18yrs age group. According to the anatomical distribution of lesions maximum cases accounting for 81.67% are lymph node lesions followed by thyroid lesions, miscellaneous, and then least salivary gland lesions which account for 2.5%. In the lymph node, thyroid, salivary gland, and miscellaneous lesions predominant lesions are respectively reactive lymphoid hyperplasia (71.42%), thyroiditis (42.85%), sialadenitis (33.34%) & epidermal cyst (40%)

Conclusion: FNAC in resource-limited settings, healthcare providers should realize the importance of FNAC as an initial screening tool for superficial lesions in paediatric population. The presumptive diagnosis after FNAC of palpable lesions in paediatric age group avoids the unnecessary definitive operative procedure. Thus, FNAC is an easy, simple, rapid, and cost-effective diagnostic procedure for paediatric age group.

KEYWORDS: FNAC, Cytology, Children, Rapid, Diagnostic tests

INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) has emerged as a pivotal diagnostic tool for evaluating head and neck lesions, particularly in the pediatric population. Its minimal invasiveness, coupled with high diagnostic accuracy, renders it invaluable in the clinical setting. Despite the procedure's simplicity and cost-effectiveness, the pediatric application of FNAC poses unique challenges, necessitating a nuanced understanding of its efficacy, limitations, and the spectrum of lesions encountered in this age group.

The utility of FNAC in diagnosing pediatric head and neck lesions is well documented, with studies highlighting its role in the rapid, safe, and effective evaluation of a wide range of pathologies, from benign reactive conditions to malignancies. [1, 2] The technique's sensitivity and specificity have been subjects of extensive research, underscoring its reliability in clinical decision-making. [3] Moreover, the procedure's minimal discomfort and low complication rate make it particularly suited for pediatric patients. [4]

The diagnostic yield of FNAC varies with the site and nature of the lesion, with lymph node aspirations revealing a broad spectrum of pediatric conditions, including reactive hyperplasia and infectious etiologies. [5, 6] The technique's performance in salivary gland and thyroid lesions has also been extensively evaluated, demonstrating its capacity to distinguish between benign and malignant pathologies with high accuracy. [7, 8] Furthermore, the operator's experience

plays a crucial role in maximizing the diagnostic potential of FNAC, impacting both the yield and the accuracy of the procedure.^[9]

Despite its advantages, FNAC is not without limitations. The technique's diagnostic accuracy is contingent upon adequate sampling, and the potential for non-diagnostic or indeterminate results persists, necessitating careful correlation with clinical and radiological findings.^[10, 11] In certain cases, FNAC serves as a preliminary step, guiding further diagnostic and therapeutic interventions.^[12, 13]

In the pediatric population, FNAC has proven particularly valuable, offering a less intimidating alternative to more invasive procedures. Its role extends beyond diagnosis to include the management and follow-up of head and neck lesions, underscoring its integral position in pediatric otolaryngology and oncology.^[14, 15]

The present study was designed to study the role of FNAC in diagnosing lesions of head & neck region based on cytomorphological features in the paediatric age group.

MATERIAL AND METHOD

The observational study was conducted in the cytology section of the Department of Pathology at Dr. Shankarrao Chavan Government Medical College and Hospital, Vishnupuri, Nanded, over one year, from January to December 2023. The study focused on the cytological evaluation of 120 palpable head and neck lesions within the pediatric population, specifically targeting individuals aged 0 to 18 years. Before the commencement of the fine needle aspiration cytology (FNAC) procedure, comprehensive informed consent was obtained from the parents or legal guardians of the pediatric patients. A detailed medical history was also meticulously recorded for each case to ensure a thorough understanding of the clinical context and any underlying health conditions that might influence the cytological assessment.

The FNAC procedure was meticulously carried out using a 10 ml syringe equipped with either a 23 or 24-gauge needle, depending on the specific requirements of each case and the anatomical location of the lesion.^[16]

The choice of needle gauge was guided by considerations such as the need for optimal cellular material retrieval and minimizing discomfort to the pediatric patient. The aspiration technique was performed with precision and care, adhering to aseptic protocols to prevent any risk of infection.

Once the aspirated material was successfully obtained, it was gently expelled onto glass slides. The material was then evenly spread across the slide surface to create a thin, uniform smear. This step was critical for ensuring the clarity and quality of the cytological preparation, as it directly impacts the ability to discern cellular details under microscopic examination.

Following the preparation of the smears, they were immediately fixed using 95% ethyl alcohol. This fixation process is vital for preserving the cellular and morphological characteristics of the aspirated material, preventing any degradation or alteration that could compromise the diagnostic accuracy of the cytological analysis.

After fixation, the slides underwent staining with hematoxylin and eosin (H&E), a widely used staining technique in cytology for its ability to provide detailed visualization of cellular structures. Hematoxylin imparts a blue-purple color to the nuclei, while eosin stains the cytoplasm and extracellular components in varying shades of pink. This differential staining facilitates the detailed examination of cell morphology, arrangement, and any pathological alterations, which are crucial for accurate diagnosis.

The stained slides were then subjected to thorough microscopic evaluation by experienced cytopathologists. This involved the assessment of various cytological parameters, including cellular architecture, nuclear features, and the presence of any diagnostic cytomorphological patterns indicative of specific pathological conditions. The findings from the FNAC analysis were then correlated with the clinical data and medical history of each patient to formulate a comprehensive diagnostic conclusion.

RESULTS:

Total 120 cases of head & neck lesions in the paediatric age group were studied. Their results are tabulated according to age, sex, anatomical distribution of lesions. In our study, out of 120 cases maximum cases belongs to age group of 11-18 years which are 76 in number and accounts 55.83%, followed by the age group of 6-10 years which are 29 in number and accounts 24.16% and least cases belongs to age group of 0-5 years which are 24 in number and accounts 20% as shown in Table 1. Gender distribution of lesions shows male predominance as shown in Table 2.

Anatomical distribution of different lesions shows that lymph node is the most common site 81.69% (98/120), followed by thyroid swelling 11.67% (14/120), miscellaneous swelling 4.16% (5/120) and least are salivary gland lesions 2.50% (3/120) as shows in Table 1.

The highest frequency involving the head and neck in paediatric cases in our study involved lymph nodes, most common being reactive lymphoid hyperplasia 71.42%, after that we found the granulomatous lesions 2nd most common having 23.46%. In the remaining cases of lymph nodes we found Hodgkins lymphoma, abscess, cold abscess, chronic non specific lymphadenitis, positive for malignant cells each counts 1.02% as shown in Table 2.

Cytomorphological diagnosis of thyroid cases :

In our study thyroiditis is the most common is thyroid swellings which counts 42.85%(6/14). In the remaining cases of thyroid we found thyroglossal cyst 14.2%, colloid goiter

| Characteristics | Groups | No. | % |
|-------------------|----------------|------------|------------|
| Age group (years) | 0 to 5 | 24 | 20 |
| | 6 to 10 | 29 | 24.2 |
| | 11 to 18 | 76 | 55.8 |
| Gender | Male | 64 | 53.3 |
| | Female | 56 | 46.7 |
| Anatomical site | Lymph node | 98 | 81.7 |
| | Thyroid | 14 | 11.7 |
| | Salivary gland | 3 | 2.5 |
| | Miscellaneous | 5 | 4.2 |
| | Total | 120 | 100 |

Table 1: Demographic and anatomical site distribution

| | Lesions | No. | % |
|--------------------|---|-----------|------------|
| Lymph Node lesions | Reactive lymphoid hyperplasia | 70 | 71.4 |
| | Granulomatous lymphadenitis | 23 | 23.5 |
| | Hodgkins lymphoma | 1 | 1.0 |
| | Abscess | 1 | 1.0 |
| | Cold abscess | 1 | 1.0 |
| | Chronic non specific lymphadenitis | 1 | 1.0 |
| | Positive for malignant cells | 1 | 1.0 |
| | Total | 98 | 100 |
| Thyroid lesions | Thyroglossal cyst | 2 | 14.2 |
| | Thyroiditis | 6 | 42.9 |
| | Colloid goiter | 1 | 7.1 |
| | Colloid goiter with changes suggestive of thyroiditis | 1 | 7.1 |
| | lymphocytic thyroiditis | 2 | 14.2 |
| | Bening cystic lesions | 2 | 14.2 |
| | Total | 14 | 100 |

Table 2: Cytomorphological Findings in Lymph Node and thyroid Lesions

7.14%, colloid goiter with changes of thyroiditis 7.14%, lymphocytic thyroiditis 14.2%, benign cystic lesions 14.2% as shown in Table 2.

In our study we found 3 cases of salivary gland lesions these includes sialadenitis, pleomorphic adenoma & acute suppurative lesion. In miscellaneous lesions we have found variability. The epidermal cyst is the most common lesion 40%. Other miscellaneous lesion includes benign cystic lesions, lipoma, abscess.

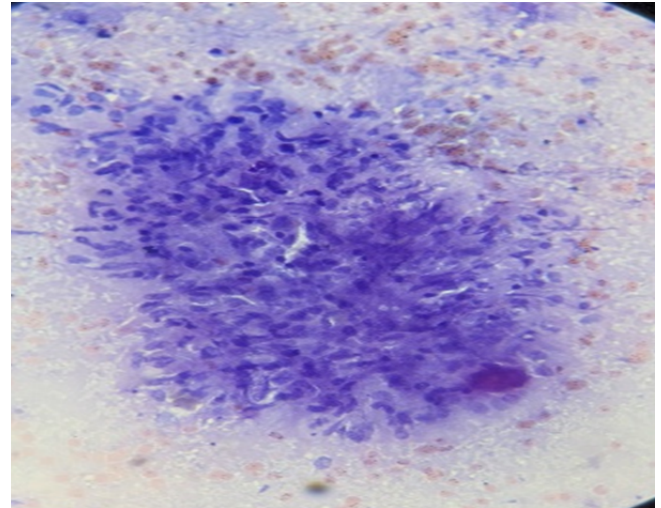


Figure 1: (40x resolution, H & E Staining) Granulomatous lymphadenitis showing well formed granuloma composed of epithelioid cells, lymphocytes and central caseous necrosis

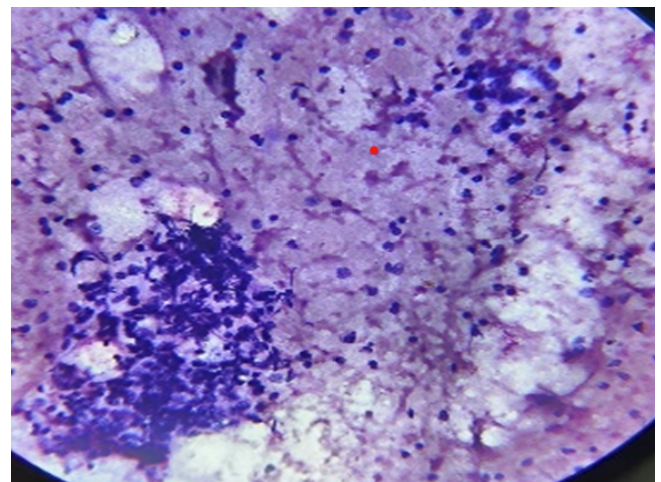


Figure 2: (40x resolution, H & E Staining) Thyroiditis showing clusters of benign follicular epithelial cells along with inflammatory cells mainly lymphocytes

Image 4 – (40x resolution, H & E Staining) Sialadenitis showing acinar and ductal cells along with inflammatory cells lymphocytes and polymorphs.

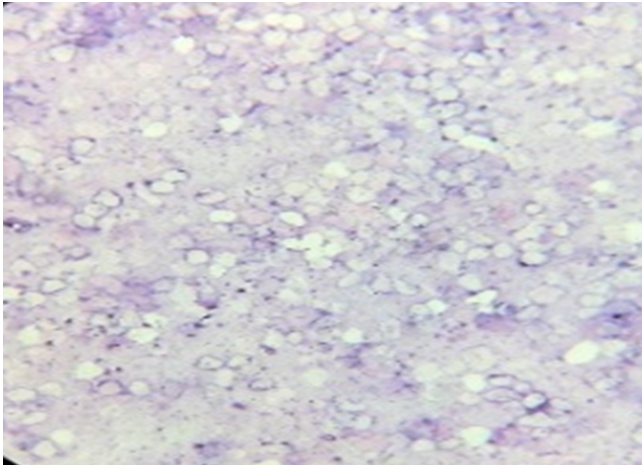


Figure 3: (10x resolution, H &E Staining) Epidermal cyst showing nucleated and anucleated squamous epithelial cells & keratinous material

DISCUSSION

In adults the use of FNAC is more popular for superficial and deep masses. But, in children there are only few studies regarding FNAC and these too are mostly elaborating its use in areas other than head and neck. [6]

In our study male predominance is there with the male to female ratio 1.14:1. Lymph node is the most common anatomical site involved in head neck region & in that reactive lymphoid hyperplasia is the, most common lesion followed by granulomatous lesion. We also found one case of Hodgkin's lymphoma & one case of positive for malignant cells which is having deposits from papillary carcinoma.

In granulomatous lymph node lesions, we found the minimum age of patient is 4 months. Cytomorphological features of granulomatous lesions showed well-formed granuloma having caseous necrosis with epithelioid cells & lymphocytes Figure 1. The thyroid lesions followed by salivary gland lesions are next to lymph node swellings. Miscellaneous lesions include epidermal cysts, lipoma, benign cystic lesions, abscesses.

After going through all the results of our study we found that our study is comparable with studies done by Handa U et al. [17], Mohan A et al. [18], M Jain et al. [19], Amy Rapackwicz et al. [1] and Madhu Kumar et al. [20]

Our study presented a relatively balanced sex distribution of 1.14:1 (Male: Female), slightly more balanced than those reported by Handa U et al. [17] and Madhu Kumar et al. [20], and closely aligning with the findings of Mohan A et al. [18] The variance in sex distribution could be due to demographic characteristics of the study populations or differences in the susceptibility of genders to certain types of head and neck lesions within different geographic or environmental contexts.

The age group in our study was 0-18 years, consistent with the ranges reported by Amy Rapkiewicz et al. [1] and Madhu Kumar et al. [20] However, Handa U et al. [17] and Mohan A et al. [18] limited their studies to a slightly narrower age range of up to 15 years, and M Jain et al. [19] focused on an even younger cohort of 0-12 years. The broader age range in our study allowed for a more inclusive analysis of pediatric head and neck lesions, possibly capturing a wider spectrum of pathological conditions prevalent in the late adolescence stage.

Cervical lymph nodes emerged as the most common site for lesions across all studies, with our findings revealing a prevalence of 71.42%. This is somewhat lower than the figures reported by Handa U et al. [17] (84.3%), Mohan A et al. [18] (83.72%), and Madhu Kumar et al. [20] (82%), but closer to the rate reported by Amy Rapkiewicz et al. [1] (69.4%). The high prevalence of cervical lymph node lesions in pediatric populations underscores the significance of this anatomical site in pediatric head and neck pathology, likely due to the lymph nodes' role in immune response and their susceptibility to a range of infectious and neoplastic conditions.

In terms of malignancy rates, our study identified a lower prevalence (0.83%) compared to Handa U et al. [17] (1.54%), Mohan A et al. [18] (2.33%), and M Jain et al. [19] (1.5%), but significantly lower than Amy Rapkiewicz et al. [1] (17%). The relatively low malignancy rate in our study, alongside the 99.16% prevalence of non-malignant lesions, may reflect the effectiveness of early diagnostic and intervention strategies, regional differences in the incidence of malignant pediatric head and neck lesions, or variations in the criteria used to classify lesions as malignant across different studies.

CONCLUSION:

FNAC in resource-limited settings, healthcare providers should realize the importance of FNAC as an initial screening tool for superficial lesions in paediatric population. As the paediatric age group is a very sensitive age group for parents as well as doctors, any swellings diagnosis in the best possible easy way, with the best possible accuracy, gives comfort to paediatric patients, their parents, and their doctors also. Based on cytomorphological features on FNAC one can differentiate whether the lesion is benign or malignant. The presumptive diagnosis after FNAC of palpable lesions in paediatric age group avoids the unnecessary definitive operative procedure. Thus, FNAC is an easy, simple, rapid, and cost-effective diagnostic procedure for paediatric age group.

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How to cite this article: Desai AR, Mohammed AS, Sadhu DS. **The Utilisation of Fine Needle Aspiration Cytology for Diagnosis of Head and Neck Lesions in Paediatric Age Group.** *Perspectives in Medical Research.* 2024;12(1):35-39
DOI: [10.47799/pimr.1201.07](https://doi.org/10.47799/pimr.1201.07)