STUDY OF UTILITY OF MANUAL LIQUID-BASED CYTOLOGY AND CONVENTIONAL SMEARS IN THE EVALUATION OF VARIOUS FINE-NEEDLE ASPIRATION SAMPLES

INTRODUCTION:

The advantages of liquid-based cytology (LBC) include rapid fixation, even distribution of cells over a smaller slide area, and decreased obscuring background elements, such as blood, inflammation, and mucus. Also, standardized LBC fixation provides advantages for centralized laboratories, especially when FNA procedures are carried out without rapid assessment. LBC preparations provide material for ancillary techniques, and their routine application in pathology laboratories with specific reference to procedure standardization and the opportunity to store cells are significant benefits of nongynecological LBC, which can be used in different organs for different applications. Only a few studies have addressed usage regarding FNA of different organs such as breast, salivary gland, thyroid gland, lymph nodes, bone, and soft tissue prepared by LBC technique. The present study was undertaken to evaluate the utility of manual LBC (MLBC) and conventional smears (CS) in various FNA samples.

MATERIALS AND METHOD:

This cross-sectional study was conducted in the Department of Pathology RIMS, Raipur, from January 2016 to December 2016. Informed consent was obtained from all patients before the initiation of the study. A total of 100 FNAs from various sites, such as lymph node, thyroid, breast, salivary gland, and soft tissue, were included.

In each site, FNA was performed using a 23-gauge needle with 5 mL syringe. In each case, two passes were made. The first pass was made for CS and the second pass was made for MLBC preparations. For CS, the sample was placed directly on the slide and the smears were made. For MLBC preparation, the sample was preserved in alcohol-based liquid preservative for a minimum of half an hour. The material was centrifuged at 1,500 rpm for 5 min. The supernatant was discarded and the pellet was agitated to get a homogenous sample. One drop of normal saline was added to the pellet and it was mixed well. A volume of 50 µL of diluted pellet was placed on clean slides with a drop of fixative solution. Stains such as May-Grumwald Giemsa (MGG), Hematoxylin and Eosin (H & E) and Papanicolaou stain (Pap) were used for staining the CS and MLBC preparations. Special staining with stains, such as Ziehl–Neelsen (ZN), for acid-fast bacilli (AFB) was performed as and when required. The representative CS and MLBC preparations were compared by a semiquantitative scoring system using several criteria, namely cellularity, blood, informative background, monolayers, cell architecture, cytoplasmic, and nuclear preservation were compared by Wilcoxon signed rank test. P < 0.05 is considered statistically significant. MLBC preparations were superior to CS preparations in view of absence of blood and debris (P = 0.001), presence of monolayers (P < 0.001), and preservation of cytoplasmic (P = 0.001) and nuclear details (P = 0.001). However, no statistically significant differences were found between MLBC and CS preparations with regard to cellularity (P = 0.157), informative background (P = 0.083), and architecture (P = 0.789) in MLBC preparations in FNAC smears, easy, and less time-consuming procedure, and it may have promising diagnostic value in the evaluation of FNA samples from various anatomical sites. However, the use of both MLBC and CS preparations is recommended to achieve optimal diagnostic yield.

RESULTS:

Among the 100 FNA samples, anatomical sites were lymph node (N = 22) (10 reactive hyperplasia, 6 granulomatous lymphadenitis, and 2 acute suppurative lymphadenitis), lymphoma and metastatic carcinoma (N = 41) (23 nodular colloid goiter, 14 thyroiditis, and 4 carcinoma), breast (N = 23) (12 fibroadenoma, 5 breast abscess, 4 fibrocystic disease, and 2 ductal carcinoma), salivary gland (N = 8) (2 chronic sialadenitis, 2 cystic lesions, and 4 pleomorphic adenoma (PA)), and soft tissue (N = 6) (4 benign spindle cell lesions and 2 sarcomas). Among the 100 FNA samples, 42 cases underwent surgical intervention and corresponding histopathological diagnoses were available. The comparison of fine-needle aspiration cytology (FNAC) diagnoses of CS and MLBC preparations with corresponding histopathological diagnoses shown in Table 1.
According to the Wilcoxon signed rank test, the present study showed that MLBC preparations were superior to CS preparations in view of absence of blood and debris (P = 0.001), presence of monolayers (P < 0.001), and preservation of cytoplasmic (P = 0.001) and nuclear details (P = 0.001). However, no statistically significant differences were found between LBC and CS preparations with regard to cellularity (P = 0.157), informative background (P = 0.083), and architecture (P = 0.739) table 2.

In the present study, it was not seen in the background of MLBC prepared slides and also we found difficulties in the recognition of prominent monolayerous condition; however, the current study support the need of CS in the evaluation of lymphadenopathy. Amount of colloid in the background plays an important role in the diagnosis of follicular lesions of thyroid. In this study, the amount of colloid on MLBC preparations was diminished and appear dense, fragmented, and in droplets. Nuclear grooves and pseudoinclusions were less apparent in papilloma and carcinomas. Similarly, few workers demonstrated these problems in their study. However, Lee et al., observed that background material were slightly superior in LBC preparation than CS preparation. In thyroid lesions, the present study found that MLBC preparations should be interpreted with great caution and CS should always be employed for the arriving of diagnosis. All the cases of breast lump were diagnosed on MLBC preparation. Mature lymphoid cells, Reed–Sternberg cells were better recognized in monolayers. Squamous cells were visualized with well-preserved keratin in metastatic squamous cell carcinoma. There was difficulty in the identification of granulomatous lesions and lymphoglandular bodies. In cases of thyroid lesions, amount of colloid was diminished significantly and it was dense, fragmented, or in droplets. There was difficulty in identifying nuclear grooves and pseudoinclusions in cases of papillary carcinoma. Hence, MLBC preparations should be interpreted with great caution and CS should always be employed for the arriving of diagnosis. All the cases of breast lump were interpreted correctly by MLBC preparation even though a stromal fragment/chondromyxoid matrix was altered or diminished. For the salivary gland swelling, in the diagnosis of PA, support of CS needed due alteration in the chondromyxoid matrix. In soft-tissue lesions, MLBC preparation showed good results due to clear background.

Table1:— Comparison of FNAC diagnoses of CS and MLBC preparations with corresponding histopathological diagnoses (N = 42)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>CS</th>
<th>MLBC</th>
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<tbody>
<tr>
<td>Carcinoma</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Benign</td>
<td>27</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>42</td>
</tr>
</tbody>
</table>

DISCUSSION:-
From the clinician’s standpoint, LBC technique is far easier, quicker, and safer and requires less skill. From the pathologist’s standpoint, the advantages of using the LBC technique are no to minimal confounding factors (blood, debris and necrotic materials), excellent cell preservation, lesser fixation artifacts (air-drying artifacts), even distribution and less overlapping of the cells and fewer numbers of slides requiring examination.

However, because of the chemical influences of the fixation medium and the physical forces of processing techniques, it tends to produce certain cytomorphic alterations and artefacts: smaller cell clusters and sheets and breakage of papillae; altered cell distribution with more discohesion and slightly more three-dimensional clusters; attenuated chromatin details with prominent nucleoli and smaller cell size; intranuclear inclusion is difficult to visualize by LBC preparation even though a stromal fragment/chondromyxoid matrix was altered or diminished. For the salivary gland swelling, in the diagnosis of PA, support of CS needed due alteration in the chondromyxoid matrix. In soft-tissue lesions, MLBC preparation showed good results due to clean background.

Table2:— Comparison of MLBC and CS preparations of the present study and the published studies

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>MLBC</th>
<th>CS</th>
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<tbody>
<tr>
<td>Breast</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>Thyroid</td>
<td>42</td>
<td>42</td>
</tr>
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</table>

In the current study, there was statistically significant differences between MLBC and CS preparations in view of absence of blood and debris, presence of monolayers, and preservation of cytoplasmic and nuclear details (P = 0.001). However, no statistically significant difference was found between these two groups with regard to cellularity, informative background, and architecture (P > 0.05). These findings were in accordance with the studies done by Tripathy et al., Mygdakos et al., and Dey et al. Köybasıoğlu et al. compared ThinPrep and CS in head and neck FNAC and found that LBC preparations were superior to CS preparations with regard to cellularity, informative background, and cytoplastic details (P < 0.005); however, the presence of monolayers, cell architecture, and cytoplastic and nuclear details were not statistically significant between two groups (P > 0.05).

CONCLUSION:—
Our study proved that MLBC preparation in FNAC is a safe, easy, and less time-consuming procedure, and it may have promising diagnostic value in the evaluation of FNAC samples from various anatomical sites. However, the use of both MLBC and CS preparations is recommended to achieve optimal diagnostic yield.

REFERENCES:—