BRITISH JOURNAL OF BIOMEDICAL SCIENCE, 2016
VOL. 73, NO. 1, 28–31
http://dx.doi.org/10.1080/09674845.2016.1144947

Fine needle aspiration cytology for lymph nodes: a three-year study

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ABSTRACT

Background and aims: The cytologic patterns of lymph node fine needle aspirations (FNAs) exhibit a wide variation in different diseases and in different ethnic groups in various geographical locations. Knowledge of lymphadenopathy patterns in a given geographical region is essential for making a confident diagnosis of suspected disease in that location. In the present study, we assessed the cytologic patterns of lymph node aspirations in patients in the Huangdao region of China.

Methods: A three-year retrospective study design was conducted on FNA cytology samples from the lymph nodes of patients in our hospital between January 2011 and December 2014.

Results: A total of 2136 lymph nodes were aspirated during the study period. Cytologic analysis of the lymph nodes revealed the following: malignancy, 53.6%; chronic non-specific lymphadenitis, 15.2%; reactive lymph node, 7.5%; pyogenic abscess, 2.9%; tuberculosis lymphadenitis, 8.7%; Hodgkin lymphoma, 4.8%; and non-Hodgkin lymphoma, 7.16%. The 30–50 year age group was the most affected age group, while lymphadenopathy in the >60 year age group was less frequent. Cervical lymph nodes were the most frequent site for lymphadenopathy in women (31.4%, $p < 0.001$) and men (49.1%, $p < 0.001$).

Conclusions: Lymphadenopathy is associated with a wide range of disorders; however, metastatic lymph nodes of malignancies are the most common cause for enlarged lymph nodes.

ARTICLE HISTORY
Received 23 November 2015
Accepted 22 December 2015

KEYWORDS
Fine needle aspiration cytology; lymph node aspiration; retrospective study

Introduction

Lymph nodes are an important part of the host defence system as filters or traps for foreign particles and as sites for antibody production. The term lymphadenopathy refers to lymph nodes which are abnormal in size, number or consistency,[1] the causes of which range from an infectious process to a malignant disease.[2] It is difficult to determine the cause of lymphadenopathy on the basis of history and physical examination alone.

Fine needle aspiration cytology (FNAC) has been widely used to as a primary diagnostic tool to examine lymphadenopathy and exclude alternative diagnoses, such as salivary gland, head and neck masses. Due to its minimally invasive nature, FNA has several advantages over standard tissue biopsy.[3–5] Lymphadenopathy is becoming a common pathologic problem in most parts of the world (such as where tuberculosis is prevalent) and a number of studies have been conducted to assess the extent of the problem. Lymphadenopathy is a clinical manifestation of regional or systemic disease, and serves as an excellent indication as to the aetiology and pathology of the underlying disease.[6] There is a wide variation in lymphadenopathy disease patterns in different ethnic groups and in various countries.[7–9] Knowledge of these patterns in a given geographic region is essential for making a definitive diagnosis of suspected disease at a specific anatomic site.

Although there are many different conditions which present with lymph node enlargement, the most common cause for enlargement of regional lymph nodes include secondary to tuberculosis lymphadenitis, malignancies, reactive hyperplasia, Hodgkin lymphoma, non-Hodgkin lymphoma, pyogenic abscesses and other chronic inflammatory conditions.[10] Lymph node enlargement has characteristic clinical features according to the causative factor, and may present as acute painful swelling due to infections or as chronic painless swelling.

The aim of this study was to determine the most frequent cytologic patterns of lymph node diseases in patients attending the Affiliated Hospital of Qingdao University, China.

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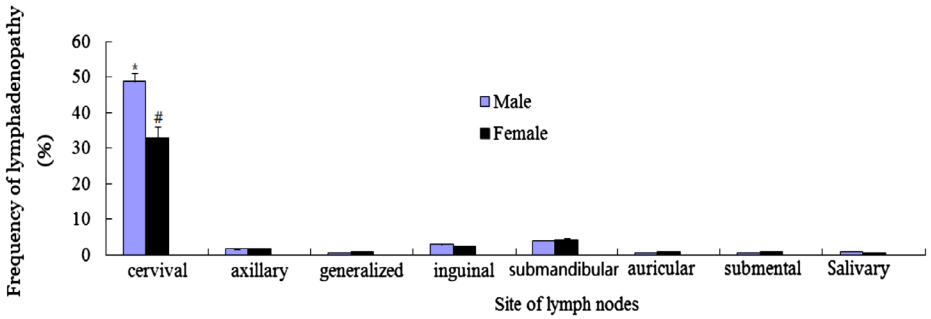

Figure 1. Magnitude of lymph node diseases by site of lymph nodes. vs. other group in male,*$p < 0.001$;vs. other group in female, #$p < 0.001$.

Materials and methods

Patients

Between January 2011 and December 2014, 1664 patients underwent FNA, of which 302 FNAs were performed under ultrasound (US) guidance; the other FNAs were performed without US support by clinical and pathology physicians. A total of 2682 lymph nodes were sampled. Cytologic patterns of lymphadenopathy in FNAC reports were studied using a cross-sectional retrospective descriptive design in the pathology laboratory of the Affiliated Hospital of Qingdao University. Of the 2682 lymph nodes samples, 247 were inadequate or non-diagnostic, 203 were negative and in 96 there was a suspicion of an abnormality, leaving 2136 lymph nodes samples upon which a firm diagnosis could be made. All FNAC reports were recorded in soft and carbon copies, then these records were used to assess the pattern of lymphadenopathy. The data were analysed to determine the frequency or pattern of the particular pathology of the FNAC sample from each enlarged lymph node.

US-guided FNA

All US-guided FNA procedures were performed on lymph nodes in 302 patients under continuous real-time US guidance with a high-resolution transducer. Each lesion was aspirated at least twice by a 21G needle. The needle was inserted obliquely within the transducer plane of view, and moved back and forth through the nodule to compensate for patient movement and needle deflection. The content of needles were expelled onto glass slides and smeared with a second slide to spread fluid across the surface. Slides were fixed in 95% ethanol, Papanicolaou-stained and read by an experienced cytopathologist.

FNA under direct vision

A total of 1362 patients with lymphadenopathy were punctured with a 5–10 ml syringe and a #7 needle. The content of needles were fixed in 95% ethanol as above, and read by an experienced cytopathologist.

Ethics statement

The study was approved by The Ethics Committee of the Affiliated Hospital of Qingdao University (China), and written informed consent was obtained from all participants prior to study entry.

Statistical analysis

Continuously variable indices are expressed as the mean ± standard deviation (SD). Categorical data from the two groups were compared using a x^2-test. A *P*-value <0.05 was considered statistically significant. SPSS software (version 11.0; SPSS, Inc., Chicago, IL, USA) was used for all statistical analyses.

Results

Distribution of lymph nodes

A total of 2136 lymph node FNACs were analysed. The male-to-female ratio was 1.23:1 (1178:958), with an age range from 8–73 years and a mean age of 38 ± 9 years. Cervical lymph nodes were the most frequent anatomic site for lymphadenopathy, accounting for 1742 (81.5%) cases [women (31.4%, $p < 0.001$) and men (49.1%, $p < 0.001$)]. The remaining cases were distributed as follows (Figure 1): submandibular, 175 (8.2%); axillary, 73 (3.4%); inguinal, 126 (5.9%); generalised, 50 (2.32%); auricular, 31(1.45%); and submental, 29 (1.36%).

Age distribution of lymph node diseases

The highest age groups affected with lymph node diseases were among the 30–39 and 40–49 year age groups with 642 (30%) and 542 (25.4%) cases, respectively, whereas the group >60 years of age was the least frequent (Table 1).

Distribution of FNAC results

As shown in Table 2, 1145 of 2136 (53.6%) lymph node diseases were malignancies. The highest morbidity rate affected the 30–50 year age group and the highest

Table 1. Pattern of lymph node diseases by age group (n = 2136).

Age(year)	MT (*n*)	TBL (*n*)	CNS (*n*)	HL (*n*)	NHL (*n*)	RL (*n*)	PA (*n*)	Total (*n*)
≤10	2	3	0	1	0	47	3	56
10–19	67	106	2	12	5	23	10	225
20–29	103	38	13	44	11	11	21	241
30–39	368	10	208	20	78	19	11	642
40–49	424	12	60	13	41	24	8	542
50–59	190	10	28	8	23	24	6	289
≥60	101	7	15	4	5	14	4	150
Total	1145	186	326	102	153	161	63	2136

Note. MT: metastatic tumours; TBL: tuberculosis lymphadenitis; CNS: chronic non-specific; HL: Hodgkin lymphoma; NHL: non-Hodgkin lymphoma; RL: reactive lymphadenitis; PA: pyogenic abscess.

Table 2. Pattern of lymph node diseases (n = 2136).

Type of lymphadenitis	Male	Female	Total
MT	675 (31.6%)	470 (22%)	1145 (53.6%)
TBL	89 (4.2%)	97 (4.5%)	186 (8.7%)
CNS	161 (7.5%)	165 (7.7%)	326 (15.2%)
HL	59 (2.8%)	43 (2.0%)	102 (4.8%)
NHL	79 (3.7%)	74 (3.5%)	153 (7.2%)
RL	73 (3.4%)	88 (4.1%)	161 (7.5%)
PA	42 (1.9%)	21 (1.0%)	63 (2.9%)
Total	1178 (55.1%)	958 (44.9%)	2136 (100%)

Note. MT: metastatic tumours; TBL: tuberculosis lymphadenitis; CNS: chronic non-specific; HL: Hodgkin lymphoma; NHL: Non-Hodgkin lymphoma; RL: reactive lymphadenitis; PA: pyogenic abscess.

frequency was recorded in males. The proportion of tuberculosis lymphadenitis was 186 (8.7%). The highest rate of tuberculosis lymphadenitis was observed in the 10–19 year age group, with 106 cases (106/186 [57%]). The 20–29 year age group was more affected with pyogenic abscesses and Hodgkin lymphoma than the other groups (Table 1), while reactive lymphadenitis was more common in the <10 year age group. A high frequency of non-Hodgkin lymphoma was observed in males with a similar distribution in all age groups. Chronic non-specific lymphadenitis, reactive lymphadenitis and Hodgkin lymphoma involved 326 (15.2%), 161 (7.5%) and 102 cases (4.8%), respectively (Table 1).

Discussion

FNA is widely accepted as a convenient, useful and cost-effective diagnostic tool for adult patients with advantages over open biopsies.[11,12] FNA for lymph nodes is the most frequently used method for diagnosis of disease of these organs. Few studies have described the usefulness of FNA for diagnosing lymph node pathologies in children and adolescents with head and neck disease.[12–14] However, FNA is not widely accepted for use in paediatric populations due to the unknown sensitivity of this technique along with a lack of familiarity with paediatric cytology smears and difficulties with obtaining sufficient aspirates associated with inadequate patient control.[13,14] Generally, lymph nodes are well known as one of the most difficult organs to evaluate with cytopathology. Some types of lymphomas are so rare that they may be not encountered during a general pathologist's career and cytological sampling can be inadequate for diagnosing partial lymph node involvement or fibrosis.[15,16]

According to our analysis, which was performed to evaluate the diagnostic usefulness of FNA in patients <20 years of age. Of 281 patients with FNAC, most were reactive lymphadenitis in patients <10 years of age, while tuberculosis lymphadenitis was most common in the 10–19 year old age group. We also showed that localised lymphadenopathy represented the largest proportion of cases, which can occur from lymph node infections or metastases. Cervical lymph nodes were the most often involved anatomic area, which is in agreement with the findings from the USA as reported by Akst et al.[17] In addition, men are more likely than women to have cervical lymphadenopathy, which may be associated with a higher incidence of cancer in men. A wide variety of diseases, such as upper respiratory tract infections, otitis, tuberculosis and conjunctivitis, are frequently associated with cervical lymphadenopathy.

The pattern of lesions in the current study varied from non-neoplastic, such as tuberculosis lymphadenitis, chronic non-specific and reactive lymphadenopathy, and neoplastic, such as metastatic lymphadenopathy and lymphomas. Lymphadenopathy is a commonly encountered clinical manifestation that requires prompt and accurate diagnosis so that a proper treatment protocol can be started as early as possible. In the present study, we showed that chronic non-specific lymphadenitis, benign reactive lymphoid hyperplasia and pyogenic abscesses were causal in 15.2, 7.5 and 2.9% of patients with lymphadenopathy, respectively, which is in agreement with the study from Turkey by Göret et al. [18] recorded as the highest cause of lymph node metastases (53.6%) in our

study. Metastatic tumours were observed to be most frequent in the 30–50 year age group, and a high frequency was recorded in males. Tuberculosis lymphadenitis was the highest cause of lymphadenopathy in Kathmandu (48.2%),[19] in Surat, India (50.5%),[20] and in northwest Ethiopia (41%) [21]; however, tuberculosis lymphadenitis was 8.7%, which was the lowest case of lymphadenopathy in our study. These findings may be associated the neonatal vaccination and higher living standards in Shandong, China. These findings might also be due to differences in sociodemographic characteristics of study participants. Otherwise, a high incidence of HIV patients was shown in the above-mentioned countries.[22] HIV can dampen immune function, bringing a risk in other infections, such as hepatitis B virus and mycobacterium species, and so a lymphadenopathy. In the current study, the 11–20 year age group was recorded to have the highest percentage of patients with tuberculosis lymphadenitis (57%), which was in agreement with the study in Surat, India.[20] This indicates that tuberculosis is still one of the most important health problems in developing countries.

Hodgkin lymphoma and non-Hodgkin lymphoma was also a frequent cause of enlarged lymph nodes in our study. High frequency of non-Hodgkin lymphoma was observed in males with a similar distribution in all age groups. Hodgkin lymphoma more frequently affected the 20–29 year age group with a similar distribution in males and females.

Conclusion

Lymphadenopathy is associated with a wide range of disorders; however, metastatic lymph nodes of malignancies were the most common cause of enlarged lymph nodes in the current study. The results found in this study in Qingdao**,** China is unique, and whether or not the pattern is suitable to other different geographic areas needs further investigation. This study represents an advance in biomedical science because it shows that the cytologic patterns of FNAs is different in various geographical locations.

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