ABSTRACT

Objective: Lymph nodes under 1 cm are presumed undetectable by palpation and considered occult. However, the threshold size of palpation has never been formally determined. It is also unclear whether clinical experience or educational interventions can improve the sensitivity of the physical examination. Our study sought to determine the threshold, sensitivity, and accuracy of node palpation and how this changes with experience.

Study Design: Retrospective cohort.

Methods: Eleven lymphadenopathy models made of poly-vinyl alcohol cryogel were created using previously published and validated techniques to mimic tissue tactility. Each contained a node embedded at standard depth within musculature and skin. Node diameter ranged 0.5 cm to 4 cm. Study subjects were medical students, otolaryngology residents, and board-certified otolaryngology consultants. Models were palpated in a randomized order and repeated for reliability. Each subject provided 22 estimates of nodal size. Primary outcomes were the sensitivity, accuracy, and threshold of palpation. Differences between groups were statistically compared using the Fisher’s Exact Test and one-way ANOVA.

Results: Thirty subjects completed the study. Sensitivity was 92%, 89%, 79%, and 86% for pre-clinical students, clinical clerks, junior residents, senior residents, and consultants, respectively (p<0.01). Error was 0.79 cm, 0.78 cm, 0.95 cm, and 0.95 cm, respectively (p<0.05). Threshold of palpation was 1.25 cm for consultants, 1.5 cm for senior residents, and 2.5 cm for all other subjects. There was no overall tendency to underestimate size.

Conclusions: Palpation by medical students can detect nodes 2 cm or greater. Level of experience was associated with decreased threshold, increased sensitivity, and increased accuracy. Educational interventions including simulation may benefit inexperienced learners and should target nodes less than 2 cm.

INTRODUCTION

Palpation remains the primary, simplest, and universal method of evaluating head and neck lymphadenopathy. For head and neck cancer, the sensitivity of palpation alone at detection of pathological nodes ranges from 60% to 82%.1,2

The discordance in sensitivity may be due to differences in examiner experience. However, the effect of experience on palpation has never been objectively quantified. In 1990, Watkinson et al. studied six participants and found that sensitivity of palpation did not increase with experience.3 In 2001, Alderson et al. found that accuracy of palpation had not been objectively quantified. Their findings suggest that individuals possess an inherent and fixed palpation ability4 or that clinicians lack necessary feedback following clinical encounters to inform modifications for skill improvement.5 However, these studies had substantial limitations and no study since has reevaluated these findings.

The present study sought to determine the effect of examiner experience on the sensitivity, accuracy, and threshold of lymph node palpation in the head and neck. We used standardized models of lymphadenopathy created from poly-vinyl alcohol cryogel (PVA-C), a synthetic polymer with tissue-mimicking mechanical properties.6,7

METHODS

Models:

- 11 models were created measuring 14x8x6 cm, 9 with a central spherical node 3 cm below the surface (Fig. 2), and 2 controls without nodes.
- Node diameters: 0.5, 0.75, 1.0, 1.25, 1.5, 2.0, 2.5, 3.0, and 4 cm
- A thin layer of external nylon mesh was used to simulate skin
- Construction was based on previously validated techniques and formulations to create different stiffness between tissue and node 8

Participants:

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Level of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-clinical students</td>
<td>Year 1-2 medical school</td>
</tr>
<tr>
<td>Clerks</td>
<td>Year 3-4 medical school</td>
</tr>
<tr>
<td>Junior otolaryngology residents</td>
<td>Year 1-3 postgraduate</td>
</tr>
<tr>
<td>Senior otolaryngology residents</td>
<td>Year 4-5 postgraduate</td>
</tr>
<tr>
<td>Otolaryngology consultants</td>
<td>Board-certified</td>
</tr>
</tbody>
</table>

Threshold decreased with experience.

Pre-clinical students were only able to palpate 52% of presented nodes, compared to 79% for junior residents, and 86% for consultants (Table 3).

Accuracy improved with experience.

The widest range of estimates were observed for pre-clinical students, while the narrowest were the consultants. Pre-clinical students had a mean error of 0.97 cm, while consultants and senior residents were off by 0.57 cm (Fig. 3).

Threshold decreased with experience.

Those more experienced were able to detect smaller nodes. The threshold was 1.25 cm for consultants, 1.5 cm for senior residents, and 2.0 cm for the remaining groups (Table 3).