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## Effect of wound massage on neck discomfort and voice changes after thyroidectomy<sup>☆</sup>

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### ABSTRACT

**Background:** Neck discomfort and voice change are common complications after thyroidectomy. These symptoms might be due to damaged laryngeal nerves, intrinsic structures, or extralaryngeal muscles. They can also occur without injury to any structure as with wound adhesion after thyroidectomy. The objective of this study was to determine causes of neck discomfort and voice change after thyroidectomy and to evaluate the effect of wound massage on symptom relief.

**Methods:** Forty-five female patients who underwent total thyroidectomy were included (21 in the experimental group and 24 in the control group). Wound massage was used as an intervention to release surgical adhesion. After wound massage education, participants in the experimental group received wound massage from 4 to 12 weeks after thyroidectomy. Analysis was performed for both groups.

**Results:** No laryngeal pathology was found after thyroidectomy. The experimental group had significantly better recovery from surgical adhesion and subjective visual analog scale, voice impairment score, and swallowing impairment score (all  $P < .01$ ) compared with the control group. Voice analysis results associated with laryngeal movement (speaking fundamental frequency, voice range profile maximum, voice range profile range) also indicated significant recovery ( $P < .01$ ) in the experimental group. These results indicate that local adhesion after thyroidectomy might affect general movement of the larynx and that wound massage could help patients recover normal general movement of the larynx.

**Conclusion:** Neck discomfort and voice change after thyroidectomy are related to local wound adhesion, possibly associated with impairment of laryngeal vertical movement. Release of wound adhesion could help patients recover from neck discomfort and voice changes after thyroidectomy.

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### Introduction

Neck discomfort and voice change are common complications after thyroidectomy. Some patients feel adhesive symptoms including difficulty with swallowing and pulling sensations during neck extension.<sup>1</sup> These neck discomforts might be caused by adhesion of

the larynx and strap muscles/subcutaneous tissues that can restrict the upward movement of the larynx during phonation or swallowing (Fig. 1).<sup>2</sup> Such restrictions to larynx movement can make patients feel localized discomfort.<sup>2</sup>

Some patients also complain of voice change after thyroidectomy. This could be caused by damaged laryngeal nerves, intrinsic structures, or damage to extralaryngeal muscles.<sup>3</sup> Damage to the recurrent laryngeal nerve is reported as the major cause of voice change, followed by damage to the superior laryngeal nerve (SLN) or cricothyroid muscle.<sup>4,5</sup> However, nerve preservation is not the only factor in the maintenance of normal voice postoperatively.<sup>6</sup> Restricted larynx movement can change movement of laryngeal muscles, thus making patients feel that their voice has changed.<sup>2</sup>

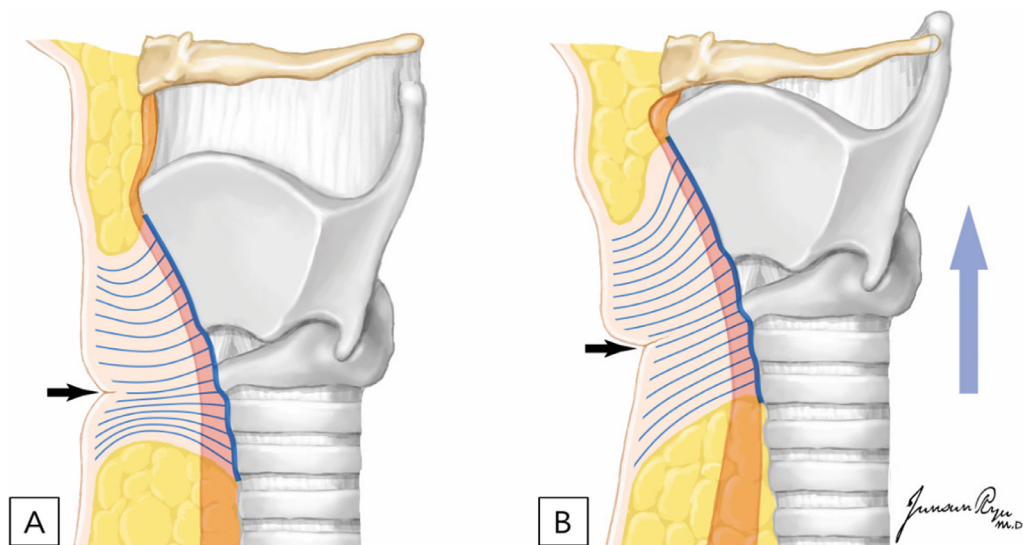
Postsurgery adhesion after thyroidectomy can be externally visible and cause discomfort. Attempts have been made by some physicians to remove such adhesions using surgical methods.<sup>7–10</sup>

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**Fig. 1.** After thyroid surgery, the larynx is usually adhesive to strap muscle/subcutaneous tissue because removal of thyroid by lateral retraction, cutting, or wound contracture with surrounding structures, will damage strap muscles/subcutaneous tissue. These injuries can result in adhesion formation between the larynx and strap muscle/subcutaneous tissue. Therefore, movement of the larynx is restricted, resulting in neck discomfort during swallowing and voice change during speech. (A) Resting. (B) Swallowing. Black arrow denotes a skin incision site.

However, these approaches result in another surgical adhesion, and their results are usually below expectation. Thus nonsurgical adhesion release methods are needed.

Wound massage can release the fibrous tension of surgical adhesions, release shortened fibers and adhesions in the muscle and subcutaneous tissue, increase the range of motion back to normal function, and provide symptom relief.<sup>11,12</sup> However, as an approach for treating neck discomfort and voice change after thyroidectomy the efficacy is currently unknown. Therefore the objective of this study was to determine causes underlying neck discomfort and voice change and to test the effect of wound massage on relief of symptoms. Results of this study could improve our understanding of neck discomfort and voice change after thyroidectomy.

## Materials and methods

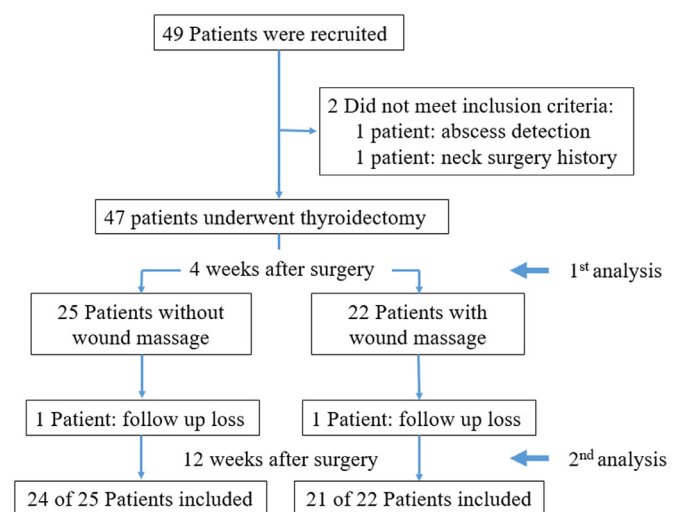
### Ethical considerations

This study was approved by the Gyeongsang National University Hospital Biomedical Research Institutional Review Board and also followed the guidelines of the Declaration of Helsinki.

### Patients

A total of 49 thyroid cancer patients who underwent thyroidectomy from January 2015 to December 2016 were initially registered for this study. Patient group allocation was determined by selection of a random number. Wound massage education was provided to participants in the experimental group. Four weeks after thyroidectomy, the experimental group started wound massage intervention (10 minutes, performed 3 times daily). Detailed patient information is provided in Fig. 2.

Inclusion criteria were (1) diagnosis of thyroid cancer and (2) history of thyroidectomy. Exclusion criteria were (1) abscess or inflammation suspected by preoperative tests; (2) history of head and neck malignancy or radiation therapy; and (3) patients with abnormal swallowing impairment score (SIS) and voice impairment score (VIS) preoperatively. Before the study, the larynx was observed with videostroboscopy. Patients with limited vocal fold movement were also excluded.



**Fig. 2.** Patient enrollment.

Finally, 45 patients (all women) were enrolled. The same surgeon (S.H.W.) performed total thyroidectomy following the same procedure each time. After thyroidectomy, patients received regular checkups. Clinical examinations and voice analyses were performed by the same speech-language pathologist (L.J.S.).

The primary outcome was the relationship between neck discomfort/voice change and wound adhesion. Age, sex, tumor size, tumor volume, incision length, histopathologic outcomes, amount of drainage, duration of hospital stay, complications, and skin distance from incision line to hyoid bone were evaluated. Voice analysis was also performed. The secondary outcome variable was each patient's objective parameters and subjective symptom changes after wound massage based on subjective and objective analysis.

### Surgical methods

Patients undergoing conventional thyroidectomy were included in this study. The surgical procedure was performed by an exper-

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