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Kinesio Taping versus Dry Needling on Pain and Range of Motion Post-Thyroidectomy

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ABSTRACT

Background: Postoperative neck pain and restricted cervical range of motion are common complications following total thyroidectomy. Effective physiotherapeutic strategies are essential for restoring function and minimizing discomfort.
Objective: This study aimed to compare the effectiveness of dry needling and kinesio taping, both combined with conventional physiotherapy, on pressure pain threshold and cervical range of motion in post-thyroidectomy patients.
Patients and Methods: A randomized controlled trial was conducted with 50 patients who had undergone total thyroidectomy. Participants were randomly assigned to either a dry needling group or a kinesio taping group. Both groups received the respective intervention three times weekly for four weeks, in addition to a standardized physiotherapy regimen. Pressure pain threshold (PPT) and cervical range of motion (CROM) were assessed pre- and post-intervention using digital algometry and goniometry.
Results: Both groups exhibited statistically significant improvements in PPT and CROM post treatment ($p < 0.001$). No significant differences were found between groups in most variables, except for neck flexion, where dry needling demonstrated a greater improvement ($p < 0.001$).
Conclusion: Dry needling and kinesio taping are both effective in reducing pain and improving cervical mobility post-thyroidectomy. Dry needling may offer additional benefits in enhancing flexion ROM. These findings support the integration of either technique into rehabilitation protocols for post-thyroidectomy patients.
Keywords: Pain, Range of Motion, Thyroidectomy, Kinesio Taping, Dry Needling.

INTRODUCTION

Thyroid cancer is among the most common endocrine malignancies, representing approximately 3% of all cancers globally. In the United States alone, an estimated 52,000 new cases are diagnosed annually, with a significantly higher incidence in women than in men. The increasing global prevalence of thyroid cancer has been attributed to advancements in diagnostic imaging techniques such as high-resolution ultrasound and fine-needle aspiration biopsies, which enable the detection of smaller and previously unnoticed tumors [(1)].

Total thyroidectomy is considered the cornerstone of treatment for thyroid cancer, often followed by radioactive iodine therapy to eliminate residual cancer cells. While this intervention is typically life-saving, it is associated with a range of complications that can adversely affect quality of life. These complications may involve injury to adjacent structures, post-operative lymphedema, and functional limitations in the cervical region [(2)].

Post-thyroidectomy complications can significantly impact patients' functional outcomes and daily activities. Cervical lymphedema is a common consequence due to disruption of lymphatic pathways during surgery, leading to swelling, discomfort, and restricted cervical mobility [(3)]. Neurological complications, particularly injury to the recurrent laryngeal nerve, can result in hoarseness, vocal fatigue, and even voice loss. Moreover, muscle stiffness and pain in the sternocleidomastoid and trapezius muscles are frequent, often leading to limited cervical ROM and functional impairments [(4)].

Conventional post-operative rehabilitation focuses on manual lymphatic drainage (MLD), therapeutic exercises, and physical modalities such as heat therapy and TENS to address swelling, pain, and mobility issues [(5,6)]. However, these interventions have notable limitations, including time demands, reliance on specialized personnel, patient adherence challenges, and variability in outcomes [(7)]. Consequently, there is a growing need for adjunct or alternative therapies that are effective, cost-efficient, and easy to integrate into patient care.

Kinesiotaping has gained popularity as a non-invasive, easily applicable intervention in musculoskeletal rehabilitation. It works by gently lifting the skin, reducing pressure on pain receptors, and improving lymphatic flow, thereby decreasing swelling and pain [(8)]. Studies have demonstrated its benefits in reducing pain, enhancing ROM, and improving proprioception in various cervical disorders, suggesting its potential application in post-thyroidectomy rehabilitation [(9)].

Dry needling is another emerging intervention that targets myofascial trigger points through needle insertion to relieve muscle tension, improve circulation, and restore mobility [(10)]. Evidence supports its effectiveness in reducing pain and improving ROM in musculoskeletal conditions, including cervical dysfunction [(11)].

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While both kinesio taping and dry needling have shown promise individually, their comparative effectiveness in managing post-thyroidectomy complications remains underexplored. Investigating these two interventions may help identify effective strategies to optimize rehabilitation and improve quality of life in this patient population.

AIM OF THE STUDY

This study aimed to compare the effectiveness of kinesio taping and dry needling on pain and cervical range of motion (CROM) in patients after total thyroidectomy.

PATIENTS AND METHODS

Study Design

This is a randomized controlled trial (RCT). **The study start at 18/1/2025 till 11/5/2025.** The intervention period lasted four weeks, with participants attending three sessions per week. Each session lasted approximately 60 minutes. To minimize bias, both participants and outcome assessors were blinded to group allocation, while therapists delivering treatment were not blinded due to the nature of the interventions.

Participants

A total of 50 patients who had undergone total thyroidectomy for thyroid cancer were recruited from Kasr Al-Ainy Teaching Hospital and the National Cancer Institute, Cairo, Egypt.

Inclusion criteria included adults aged 30–55 years, at least four weeks post-surgery, experiencing mild to moderate pain and/or restricted CROM, medically stable, and able to provide written informed consent.

Exclusion criteria included active cancer or ongoing treatment, severe neurological or musculoskeletal disorders, lymphatic disorders, major post-surgical complications (e.g., severe infection, recurrent laryngeal nerve injury, or persistent hypocalcemia), pregnancy or breastfeeding, contraindications to kinesio taping or dry needling, and cognitive impairment that would prevent protocol adherence.

Sample Size Calculation

The sample size was determined using G*Power software (version 3.1.9.7) for an independent t-test with $\alpha = 0.05$, power $(1-\beta) = 0.95$, and an expected effect size (Cohen's d) of 1.17the effect size was determined according to a study conducted by **Yildiz*et al.*[12],** reflecting a large clinically significant difference between interventions. Based on these parameters, a minimum of 40 participants (20 per group) was required to ensure adequate statistical power. The calculation assumed mean VAS scores of 4.1 (SD = 1.8) for the dry needling group and 6.5 (SD = 2.0) for the kinesiotaping group.

Randomization and Blinding

Participants were randomly allocated into two equal groups using a computer-generated randomization table. Allocation concealment was ensured through sealed, opaque envelopes opened only at the time of intervention assignment. While the physiotherapists performing the interventions could not be blinded, both participants and the assessors recording outcomes were blinded to group allocation.

Interventions

All participants received forty minutes of a standard physiotherapy program per session, three sessions per a week for four weeks. This program included five minutes of heat application to the cervical region, ten minutes of stretching exercises targeting the neck muscles, ten minutes of soft tissue mobilization to relieve muscle tightness, ten minutes of strengthening exercises to restore neck stability, and a five-minute cool-down phase involving gentle neck stretches and relaxation.

In addition to a standard physiotherapy program, participants in the kinesiotaping group received therapeutic kinesio tape application for 20 minutes during each session. The tape was applied longitudinally along the sternocleidomastoid and trapezius muscles in a stretched position to support the muscles, reduce tension, and promote improved ROM. The tape was worn between sessions to provide continuous support.

Participants in the dry needling group received 20 minutes of dry needling treatment targeting trigger points in the sternocleidomastoid and trapezius muscles. Sterile, single-use needles (0.25–0.30 mm) were inserted into identified trigger points and retained for 10–15 minutes to release muscle tension and improve blood flow. A twitch response was observed when achieved, followed by gentle muscle stretching after needle removal. Both interventions were administered three times per week over four weeks.

Outcome Measures

Primary outcomes included pain sensitivity and cervical ROM, measured at baseline and after four weeks of intervention. Pain sensitivity was assessed using a digital pressure algometer applied perpendicularly to the sternocleidomastoid and trapezius muscles at a controlled rate until participants reported pain threshold. Three readings were taken at each site, and the average was used for analysis. Cervical ROM was measured using a digital goniometer in six directions: flexion, extension, right and left lateral flexion, and right and left rotation. Both instruments demonstrated high reliability (intraclass correlation coefficient > 0.80).

Equipment

The pain thresholdwas measured using the Soonkoda Digital Force Gauge which made in china by soonkoda company, which offers precise pressure measurements and supports multiple units of force measurement. Cervical ROM was assessed using the Rainyb Digital Angle Finder which made in china by Rainyb company, a device with 0–360 ° range and ±0.5 ° accuracy. Additional therapeutic equipment included elastic adhesive kinesio tape, cutting scissors and alcohol wipes for skin preparation, as well as sterile, single-use dry needles and antiseptic solutions for dry needling procedures.

Statistical Analysis

All statistical analyses were performed using the

Statistical Package for the Social Sciences (SPSS), version **29.0 (IBM Corp., 2024)**. Quantitative datawere presented as means and standard. Within-group comparisons of pre- and post-intervention quantitative data were performed using paired t-tests, while between-group differences were assessed using independent t-tests**,** ***Wilcoxon signed-rank test***. Chi-squared test was used to compare categorical data, which were presented as frequency and percentage. P value less than 0.05 was considered statistically significant value.Effect sizes were calculated using Cohen's d, with values greater than 0.8 indicating a large effect.

Ethical considerations:

All participants provided informed consent after a verbal and written explanation of the study procedures. The study was approved by ethical committee of Faculty of Physical Therapy, Cairo University (P.T.REC/012/005687). This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

RESULTS

Patient's demographic data:

The number of each group is 25. Group B was significantly older than group A. Both groups demonstrated similar BMI values indicating no significant difference in weight status. Gender distribution was identical. There was no significant difference between two groups regarding patient's other demographic data **(Table 1)**.

3.2 Pressure pain threshold (PPT)

The number of each group is 25. Both groups demonstrated significant improvements in pressure pain threshold (PPT) from pre- to post-intervention on both sides. Large effect sizes were reported for both groups (Cohen's d = -2.71 to -3.91), confirming clinically meaningful changes. Paired t-tests yielded highly significant t-values **(Table 2)**.

Table 1 : Baseline Characteristics of the Study Groups &Sex Distribution Across Groups

Sex Distribution	Group A	Group B	X^2	p- value
Females	24 (96.0%)	24 (96.0%)	0	1
Males	1 (%4.0)	1 (%4.0)		
Missing Label	Group	Mean ± SD	*p*-value	Mean Difference
Age (years)	A	41.60 ± 6.87	0.01	-4.76
	B	46.36 ± 5.62		
BMI (kg/m²)	A	25.01 ± 1.99	0.802	0.14
	B	24.86 ± 2.06		
Type of surgery	A	25 (100%) Total Thyroidectomy	1	-
	B	25(100%) Total Thyroidectomy		-
Chemotherapy	A	24(96.0%) Received	1	-
	B	24(96.0%) Received		
Radiotherapy	A	25(100%) Received	1	-
	B	25(100%) Received		

t: Independent samples t-test used, X^2: Chi-Square test, SD = Standard Deviation; SE = Standard Error, BMI: Bady Mass Index.

Table 2: Pre–Post Comparison of Pressure Pain Threshold (PPT) in Groups A and B

Side	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Mean Difference	*Wilcoxon Z value*	*p*-value
ight	A	2.52 ± 0.68	4.51 ± 0.86	-1.99	-4.01	<0.001
	B	2.36 ± 0.67	4.31 ± 0.95	-1.96	-4.00	<0.001
Left	A	2.50 ± 0.68	4.50 ± 0.86	-2.01	-4.20	<0.001
	B	2.35 ± 0.67	4.26 ± 0.86	-1.91	-3.95	<0.001

Note: ***Wilcoxon signed-rank test*** used. SD = Standard Deviation.

Cervical ROM

Both groups showed significant within-group improvements in cervical ROM across all six directions: lateral flexion, rotation, flexion, and extension. Effect sizes ranged from 2.29 to 8.00, confirming clinically meaningful changes **(Table 3)**.

Table 3: Pre–Post Comparison of Cervical Range of Motion (ROM) in Groups A and B

Motion	Group	N	Pre-Test Mean ± SD	Post-Test Mean ± SD	Mean Difference	*t*-value	df	*p*-value	SE Difference	Cohen's *d*
Right Lateral Flexion (°)	A	25	32.67 ± 4.89	44.78 ± 5.97	-12.12	-21.2	24	<0.001	0.571	-4.24
	B	25	32.81 ± 3.71	43.32 ± 4.25	-10.51	-13.2	24	<0.001	0.795	-2.64
Left Lateral Flexion (°)	A	25	32.61 ± 4.83	45.09 ± 4.47	-12.48	-17.3	24	<0.001	0.722	-3.46
	B	25	32.94 ± 3.96	44.18 ± 4.27	-11.24	-18.1	24	<0.001	0.622	-3.62
Right Rotation (°)	A	25	73.57 ± 4.41	81.49 ± 2.25	-7.92	-11.4	24	<0.001	0.692	-2.29
	B	25	73.90 ± 4.04	80.83 ± 2.84	-6.94	-15.5	24	<0.001	0.446	-3.11
Left Rotation (°)	A	25	73.12 ± 5.23	81.35 ± 3.07	-8.23	-12.9	24	<0.001	0.639	-2.58
	B	25	72.80 ± 4.64	81.29 ± 3.51	-8.50	-15.9	24	<0.001	0.536	-3.17
Extension (°)	A	25	24.98 ± 2.19	46.08 ± 2.20	-21.10	-36.6	24	<0.001	0.577	-7.32
	B	25	25.13 ± 1.89	46.85 ± 2.00	-21.72	-38.8	24	<0.001	0.560	-7.75
Flexion (°)	A	25	27.05 ± 2.64	40.41 ± 1.39	-13.36	-27.7	24	<0.001	0.482	-5.55
	B	25	26.10 ± 1.60	38.95 ± 1.34	-12.85	-40.0	24	<0.001	0.321	-8.00

Note: Paired samples *t*-test used. SD = Standard Deviation; SE = Standard Error. Cohen's *d* indicates effect size (*d*> 0.8 = large effect).

Between-group comparisons showed no significant differences at baseline or for most post-intervention measures, except for neck flexion, where Group A achieved slightly higher post-test values.

DISCUSSION

This randomized controlled trial compared the effectiveness of dry needling (DN) and kinesiotaping (KT), combined with conventional physiotherapy, in improving pressure pain threshold (PPT) and cervical range of motion (CROM) in post-thyroidectomy patients. Both interventions were administered for four weeks, and significant within-group improvements were observed in PPT and all measured ROM directions. These findings indicate that both DN and KT are effective adjuncts to conventional rehabilitation for this patient population, supporting their clinical utility.

The study demonstrated significant increases in PPT in both groups, suggesting that DN and KT effectively reduced pain sensitivity. These results align with previous research reporting DN's efficacy in reducing pain intensity and increasing PPT in myofascial pain conditions [13,14]. Similarly, KT has been associated with improved PPT and pain reduction in individuals with neck pain [14,15]. The consistency of these findings across

Other movements, including lateral flexion, rotation, and extension, did not differ significantly post-intervention. These findings suggest both interventions were highly effective in improving cervical ROM, with comparable outcomes across most movement directions. different populations strengthens the evidence for using these interventions in postoperative rehabilitation.

Significant improvements were observed in lateral flexion ROM bilaterally in both groups. These gains are clinically relevant, given the frequent restriction of lateral flexion following thyroidectomy due to muscle tension and scar tissue. Comparable findings have been reported in prior studies, where KT enhanced lateral flexion in patients with neck injuries [14,15] and DN improved mobility in mechanical neck pain [13,16]. These improvements likely result from pain reduction and improved muscle elasticity.

Right and left cervical rotation improved significantly in both groups, which is essential for functional activities such as driving and visual scanning. Similar outcomes have been documented by **Mejuto-Vázquez *et al.*** [17] and **Fernández-Carnero *et al.*** [18], who reported that DN enhanced cervical rotation by reducing trigger point activity. For KT, studies by **Thelen *et al.*** [19] and **González-Iglesias *et al.*** [16] confirmed its role in

improving cervical rotation through neurosensory stimulation and facilitation of fascial gliding.

Cervical extension improved substantially in both groups, addressing a known functional limitation in post-thyroidectomy patients caused by anterior scar adhesion and muscle guarding. These findings agreed with reports by **Fernández-de-Las-Peñas *et al.* [14] and Mejuto-Vázquez *et al.* [17]** for DN, and by **González-Iglesias *et al.* [16]** and **Thelen *et al.* [19]** for KT. Improvements in extension are likely attributable to decreased myofascial restriction and increased neuromuscular facilitation.

Both interventions significantly improved cervical flexion, though DN showed superior outcomes compared to KT ($p < 0.001$). This difference may be due to DN's ability to target deep trigger points and modulate neuromuscular activity more effectively. Similar results have been reported in previous research, where DN improved flexion in patients with neck pain [13,18]. KT has also demonstrated positive effects on cervical flexion in chronic neck pain patients, as shown by **Saavedra-Hernández *et al.* [15]** and **Castro-Sánchez *et al.* [20]**, but its impact may be less pronounced than DN.

LIMITATIONS

Despite the promising findings, this study has limitations. The relatively small sample size may limit the generalizability of results, and the short intervention period precludes assessment of long-term effects. Additionally, the absence of a sham or placebo control group restricts the ability to determine the extent to which improvements were due to treatment-specific mechanisms versus placebo effects. Future research should include larger sample sizes, extended follow-up, and control groups to strengthen the evidence.

CONCLUSION

This study provides evidence that a combined dry needling or kinesio taping with conventional physiotherapy, effectively reduce pain and improve cervical range of motion in post-thyroidectomy patients. While both modalities demonstrated significant benefits, dry needling showed greater improvement in cervical flexion, suggesting potential superiority for certain outcomes. These interventions can be considered as valuable components of rehabilitation programs for enhancing functional recovery and quality of life in this patient population.

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- **Conflict of interest**
- The authors stated no conflict of interest.
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