A310 Predictors of Tunneling Time in Transoral Robotic Thyroidectomy: Impact of Anatomical Measurements

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BACKGROUND & INTRODUCTION

- Transoral robotic and endoscopic thyroidectomy is feasible and comparable to conventional transcervical thyroidectomy in highly selected patients
- Transoral endoscopic thyroidectomy vestibular approach (TOETVA) was introduced in 2015
  - Limitation: 2D visualization and rigid instrumentation
- Transoral robotic thyroidectomy vestibular approach (TORTVA) has emerged to complement the limitation of TOETVA
  - Meticulous dissection by flexible and articulated motion of the robotic arms
  - Magnified 3D view of the surgical field
- The impact of BMI on operative time in TOETVA (Yao T et al., 2024)
  - BMI was not significantly associated with operative time
- Predictive model of operative time in TOETVA (Russell JO et al., 2021)
  - Total thyroidectomy and lobe size were the only significant predictors

OBJECTIVE

- To evaluate the factors that influence tunneling time in TORTVA using preoperative neck CT imaging data

MATERIALS and METHODS

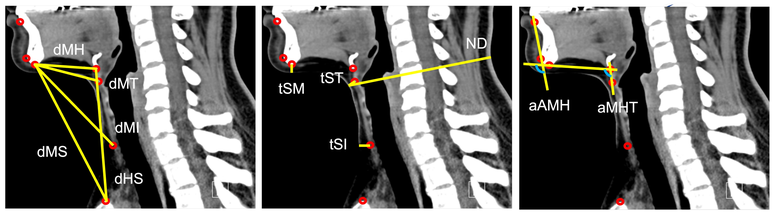
- 33 patients who underwent TORTVA from October 2023 to December 2024

CT image analysis

- Preoperative neck CT were performed in supine position with headrest cushion to avoid flexion or extension
- In the axial view, the midline at the thyroid cartilage notch level was selected as the reference line, and the corresponding sagittal view was observed.

Anatomical point(7)	Description
The alveolar process ridge	The ridge of the alveolar process in the mandible
The anterior mental border	The point where a tangent from the alveolar process ridge meets the most anterior aspect of the mentum
The hyoid bone inferior border	The lowest point on the hyoid bone
The inferior mental border	The point where a tangent from the inferior border of hyoid bone meets the most inferior aspect of the mentum
The thyroid cartilage notch	The superior notch of the thyroid cartilage
The inferior midline of the thyroid isthmus	The lowest central point on the thyroid isthmus
The sternal notch	The most superior aspect of the sternal notch

Measurement (11)	Description
Mentum-to-hyoid distance (dMH)	Distance from the inferior mental border to the hyoid bone inferior border
Mentum-to-thyroid cartilage notch distance (dMT)	Distance from the inferior mental border to the thyroid cartilage notch
Mentum-to-thyroid isthmus distance (dMI)	Distance from the inferior mental border to the inferior midline of the thyroid isthmus
Mentum-to-sternal notch distance (dMS)	Distance from the inferior mental border to the sternal notch
Hyoid bone-to-sternal notch distance (dHS)	Distance from the hyoid bone inferior border to the sternal notch
Skin-to-mentum thickness (tSM)	Vertical distance from the point of tangency on the inferior mental border to the skin
Skin-to-thyroid cartilage notch thickness (tST)	Distance from skin to the thyroid cartilage notch
Skin-to-thyroid isthmus thickness (tST)	Distance from skin to the inferior midline of the thyroid isthmus
Neck anterior to posterior diameter (ND)	Neck diameter from skin of the thyroid cartilage notch to posterior neck, parallel to the vertebra
Alveolar process ridge-to-mentum-to-hyoid bone angle (aAMH)	Angle of the alveolar process ridge-to-the anterior mental border plane and the inferior mental border-to-the hyoid bone inferior border plane
Mentum-to-hyoid bone-to-thyroid cartilage notch angle (aMHT)	Angle of the inferior mental border-to-the hyoid bone inferior border plane and the hyoid bone inferior border-to-the thyroid cartilage notch plane



Tunneling time

- The time required from the initial three incisions in the oral vestibule to placement of three trocars
  - Three incisions in oral vestibule
  - Hydrodissection with epinephrine solution (1:200,000) through the incisions down to the subplatysmal plane
  - Blunt dissection using a sequential approach with curved Halsted mosquito hemostatic forceps, curved Crile hemostatic forceps, curved Kelly hemostatic forceps, curved Wertheim atraumatic parametrium clamp, and 8-mm-tipped vascular surgical tunneler
  - From vestibule to sternal notch
  - Three 10-mm trocars were inserted through the incisions
  - The midline trocar was maneuvered to interconnect with each lateral trocar, enabling the creation of a continuous working space

RESULTS

Demographics

- Sex: 11 (33.3%) males, 22 (66.7%) females
- Height (cm): 163.9 ± 7.8
- Weight (kg): 66.3 ± 14.9
- Tunneling time (min): 25.3 ± 8.2

Comparison according to sex

	Total (n=33)	Male (n=11)	Female (n=22)	*p*-value
Age (yrs)	42.3±11.5	40.0±8.1	43.4±12.9	.462
Height (cm)	163.9±7.8	172.5±4.4	159.6±5.0	<.001*
Weight (kg)	66.3±14.9	78.2±16.3	60.3±10.1	<.001*
BMI (kg/m^2)	24.5±4.3	26.2±5.1	23.6±3.6	.044*
Tunneling time (min)	25.3±8.2	25.6±8.1	25.2±8.4	.925
dMH (mm)	41.3±6.8	41.9±9.4	40.9±5.2	.866
dMT (mm)	43.4±8.3	46.1±9.9	41.3±6.4	.201
dMI (mm)	82.9±14.1	94.6±11.7	76.8±11.5	.001*
dMS (mm)	104.9±18.8	116.8±17.9	97.6±15.3	.005*
dHS (mm)	97.2±12.6	97.9±18.5	96.4±8.9	.462
tSM (mm)	6.7±2.1	7.3±1.9	6.3±2.1	.468
tST (mm)	8.7±5.3	5.6±5.4	10.2±4.8	.178
tSI (mm)	10.6±6.4	12.4±9.2	9.8±4.7	.002*
ND (mm)	116.4±14.0	132.2±8.7	108.2±8.4	<.001*
aAMH (°)	103.2±13.0	112.5±12.2	97.9±10.6	.002*
aMHT (°)	86.9±23.3	93.6±25.5	81.8±20.4	.281
Thyroid size (cm^3)	17.1±4.9	17.7±3.4	17.0±5.6	.534

Uni-/Multivariate regression analysis

		Univariate analysis		Multivariate analysis	
	Results	coefficient	*p*-value	Standardized *β* (95% CI)	*p*-value
Age (yrs)	42.3±11.5	-0.293	.474		
Height (cm)	163.9±7.8	0.114	.260		
Weight (kg)	66.3±14.9	0.357	.019*		
BMI (kg/m^2)	24.5±4.3	0.375	.015*		
dMH (mm)	41.3±6.8	0.392	.011*		
dMT (mm)	43.4±8.3	0.389	.011*	0.347 (0.040-0.654)	.028*
dMI (mm)	82.9±14.1	-0.226	.100		
dMS (mm)	104.9±18.8	-0.116	.257		
dHS (mm)	97.2±12.6	-0.363	.017*		
tSM (mm)	6.7±2.1	0.133	.227		
tST (mm)	8.7±5.3	0.397	.010*	0.550 (0.076-1.025)	.024*
tSI (mm)	10.6±6.4	0.352	.021*		
ND (mm)	116.4±14.0	0.197	.132		
aAMH (°)	103.2±13.0	0.031	.432		
aMHT (°)	86.9±23.3	0.343	.024*		
Thyroid size (mm^3)	17.1±4.9	-0.029	.436		

CONCLUSION

- Tunneling plays a pivotal role in ensuring the smooth progression and ultimate success of TORTVA
- This study highlights the importance of preoperative CT imaging in predicting tunneling time and optimizing patient selection.
- Skin-to-thyroid cartilage notch thickness (tST) and mentum-to-thyroid cartilage notch distance(dMT) are independent predictors of tunneling time

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