

Effect of posture on swallowing.

Ahmad H. Alghadir, Hamayun Zafar, Einas S. Al-Eisa, Zaheen A. Iqbal

Rehabilitation Research Chair, College of Applied Medical Sciences, King Saud University, Riyadh, KSA.

Abstract

Background: Swallowing is a systematic process. Any structural, physiological or neurological disturbance in this process may cause dysphagia. Although there are studies that report head/neck movements during mastication, there are fewer studies that show the effect of different head/neck postures on difficulty while swallowing.

Objectives: To observe the effect of different body postures on the self-perceived difficulty while swallowing in normal healthy subjects.

Methods: Participants were asked to swallow 25 ml of water in one go while sitting upright, sitting with head/neck flexed, head/neck extended and lying supine. Following this, they had to rate their self-perceived difficulty while swallowing on a scale of 0-10, 0 being most easy and 10 being most difficult.

Results: 186 subjects with mean age 32.7 SD 9.04 participated in this study. It was found to be least difficult to swallow when subjects were asked to swallow in upright sitting position. Statistically significant differences were found between sitting upright, sitting with head/neck flexed, head/neck extended and lying supine.

Conclusion: Postural modification may help in rehabilitation of patients with dysphagia by affecting bolus flow to improve speed and safety of swallowing by closure of airways to prevent aspiration.

Keywords: Swallowing, posture, dysphagia.

DOI: <https://dx.doi.org/10.4314/ahs.v17i1.17>

Cite as: Alghadir AH, Zafar H, Al-Eisa ES, Iqbal ZA. Effect of posture on swallowing. *Afri Health Sci.* 2017;17(1): 133-137. <https://dx.doi.org/10.4314/ahs.v17i1.17>

Introduction

Swallowing involves a predictable and systematic process.¹ Any structural, physiological or neurological disturbance in this process may cause dysphagia.² Approximately, 33 to 73% of patients are reported to suffer dysphagia following stroke, motor neuron disease, Parkinson's disease, cerebral palsy, etc.^{3,4} It can further lead to aspiration pneumonia, dehydration, malnutrition and other serious complications.⁵ Clinical presentation may vary from patient to patient and that needs to be taken into consideration while planning rehabilitation.^{6,7} Various techniques have

been proposed to improve the swallowing function that can improve patient's quality of life.^{2,8}

Mandibular movements during mastication have been shown to cause head movements.^{9,10} Chewing induces head extension due to co-contraction of sternocleidomastoid and trapezius muscles along with jaw muscles.^{11,12} These movements facilitate effective chewing of the bolus,¹³ in preparation for swallowing. Although there are studies that report head/neck movements during mastication, there are fewer studies that show the effect of head/neck position on difficulty while swallowing. Head flexion and extension has been shown to decrease the opening of airways and esophagus.¹⁴ Modification of body position can help to improve rehabilitation of such patients. In this study, we decided to see the effect of different body postures while sitting and lying on swallowing in normal healthy subjects.

Methods:

Two hundred healthy adult males, aged between 20-40 years, were invited to participate in this study. They were assessed for any neurological or musculoskeletal pain and excluded if any sign or symptom was found to be present.

Corresponding author:

Zaheen A. Iqbal,
Rehabilitation Research Chair RRC,
King Saud University,
P.O. Box 10219,
Riyadh 11433, KSA
Tel.: +966569086528;
Fax: +96614693589
E-mail address: z_iqbal001@yahoo.com

They were informed about the nature of study and required to provide informed consent. This study was conducted after receiving ethical clearance from institutional review board.

Participants were asked to swallow 25 ml of water in one go while sitting upright, sitting with head/neck flexed, head/neck extended and lying supine. Following this, they had to rate their self-perceived difficulty while swallowing on a scale of 0-10, 0 being most easy and 10 being most difficult.

Statistical difference was tested by Friedman test non-parametric repeated measures ANOVA using Graph-Pad Instat 3.0 GraphPad Software Inc., CA, USA. The difference was considered significant for p values less than 0.05.

Results

After testing for inclusion and exclusion criteria, 186 subjects with mean age 32.70 SD 9.04 participated in this study. Mean SD for self-perceived difficulty while swallowing has been presented in table 1.

Table 1 – Self-perceived difficulty while swallowing on scale of 0-10, 0 being most easy and 10 being most difficult

	Sitting upright	Sitting with head/neck flexed	Sitting with head/neck extended	lying supine
Mean	0.52	2.79	4.69	6.96
SD	0.75	1.22	1.53	1.59

In comparison of all tested postures, self-perceived difficulty for swallowing was found to be least while subjects were sitting upright. Statistically significant differences

were found between sitting upright, sitting with head/neck flexed, head/neck extended and lying supine. Table 2.

Table 2 – Comparison of swallowing during different postures

Postures	Significance
Upright sitting vs head/neck flexion	***
Upright sitting vs head/neck extension	***
Upright sitting vs supine lying	***
Head/neck flexion vs head/neck extension	***
Head/neck flexion vs supine lying	***
Head/neck extension vs supine lying	***

*** Extremely significant, p<0.001

Discussion

We saw the effect of different body postures on the self-perceived difficulty while swallowing in normal healthy subjects. It was found to be least when subjects were asked to swallow in upright sitting position. Statistically significant differences were found between sitting upright, sitting with head/neck flexed, head/neck extended and lying supine.

There are individual differences in swallowing and dysphagia limit depending on individual condition, preferences and habits. However, different head and neck positions can facilitate the process of swallowing to eliminate aspiration; etc.^{15,16} that can help patients with various dysfunctions. Various changes occur in mechanism of swallowing with aging, including slowing of oral stage and trigger of pharyngeal swallow.¹⁷

It has been shown that while swallowing different volumes of water, healthy adults didn't experience piecemeal deglutition or aspiration; however while swallowing with head in extension physiologic dysphagia was seen.^{18,19} Similarly, our results also show that subjects reported maximum difficulty in swallowing while sitting with head and neck in extension. During neck extension, there is mechanical widening of laryngeal vestibule and narrowing of valleculae, leading to decrease in upper esophageal sphincter relaxation and difficulty in its closure.^{20,21} This position should be avoided while training patients with various swallowing disorders.

Chin tuck position makes the vallecular space wide and airway entrance narrow to prevent aspiration.^{22,23} It also decreases pharyngeal contraction to decrease dysphagia limit.^{24,25} There is reduction in all the measured distances in the pharynx with flexion of head and neck.²⁴ Swallowing with chin tuck is one of the commonly used techniques to facilitate swallowing and prevent aspiration.^{23,24} Our results show that swallowing while sitting with head/neck flexed was comparatively easier than that in extension position but more difficult than while sitting upright. This could be due to increased muscle tension in this position. Tension leads to shortening of muscles of base of tongue that lifts the hyoid bone and decreases laryngeal elevation.²⁴

During chin tuck position distance between the larynx and hyoid bone, and hyoid bone and mandible bone has been shown to lessen as compared to head/neck extension position.²⁴ This causes laryngeal elevation, closure of airways and reduction of pharyngeal peak contraction.^{21,25} This could be an ideal position to prevent aspiration. Rotation of head can facilitate more efficient swallowing by directing the flow of bolus towards more sensitive and stronger side of pharynx where pharyngeal cavities are closed.²⁶ It also facilitates the opening of the upper esophageal sphincter.²⁷

To facilitate swallowing combination of different techniques is often recommended while rehabilitating patients with oropharyngeal dysfunction.^{28,29} Mechanism of swallowing varies with different techniques. However, consideration of posture while application of such techniques is often not done. In this study, we saw the effect of different body postures on self-perceived difficulty while swallowing in normal healthy subjects. Subjects reported that in comparison to sitting with head/neck extended

and lying supine, swallowing was easiest while sitting upright and head/neck flexed. Postural modification may help in treatment of dysphagia by affecting bolus flow to improve speed and safety of swallowing by closure of airways to prevent aspiration.

Limitations

Our study was done in normal subjects who had a fixed pattern of swallowing. Most of the studies available in literature use video fluoroscopy, manometry and other electrophysiological investigations as outcome measures^{27,30} in dysphagia patients. Due to ethical reasons we could not expose our subjects to such radiation; hence we used only self-perceived difficulty while swallowing as an outcome measure. Similar studies in dysphagia patients, who present with individual variation in the process, would reveal a better picture on how a specific posture can affect swallowing pattern.

Conflict of interest

Authors have no Conflict of interest to declare.

Acknowledgement

The authors are grateful to the Deanship of Scientific Research, King Saud University for funding through Vice Deanship of Scientific Research Chairs

References

1. Ekberg O, Pokieser P. Radiologic evaluation of the dysphagic patient. *European radiology*. 1997;78:1285-95. Epub 1997/01/01.
2. Logemann JA. Swallowing disorders. Best practice & research Clinical gastroenterology. 2007; 214:563-73. Epub 2007/07/24.
3. Paciaroni M, Mazzotta G, Corea F, Caso V, Venti M, Milia P, et al. Dysphagia following Stroke. *European neurology*. 2004;513:162-7. Epub 2004/04/10. PubMed
4. Gisel EG, Alphonse E. Classification of eating impairments based on eating efficiency in children with cerebral palsy. *Dysphagia*. 1995;104:268-74. Epub 1995/01/01. PubMed
5. Langmore SE, Terpenning MS, Schork A, Chen Y, Murray JT, Lopatin D, et al. Predictors of aspiration pneumonia: how important is dysphagia? *Dysphagia*. 1998;132:69-81. Epub 1998/03/26. PubMed
6. Lazarus C, Logemann JA, Gibbons P. Effects of maneuvers on swallowing function in a dysphagic oral

- cancer patient. *Head & neck*. 1993;155:419-24. *Epub* 1993/09/01. PubMed
7. Lazarus CL, Logemann JA, Rademaker AW, Kahrilas PJ, Pajak T, Lazar R, et al. Effects of bolus volume, viscosity, and repeated swallows in nonstroke subjects and stroke patients. *Archives of physical medicine and rehabilitation*. 1993;74:1066-70. *Epub* 1993/10/01.
 8. Don Kim K, Lee HJ, Lee MH, Ryu HJ. Effects of neck exercises on swallowing function of patients with stroke. *J Phys Ther Sci*. 2015;274:1005-8. *Epub* 2015/05/23. PubMed
 9. Eriksson PO, Haggman-Henrikson B, Nordh E, Zafar H. Co-ordinated mandibular and head-neck movements during rhythmic jaw activities in man. *Journal of dental research*. 2000;79:1378-84. *Epub* 2000/07/13.
 10. Zafar H, Eriksson PO, Nordh E, Haggman-Henrikson B. Wireless optoelectronic recordings of mandibular and associated head-neck movements in man: a methodological study. *Journal of oral rehabilitation*. 2000;27:227-38. *Epub* 2000/04/28.
 11. Alghadir A, Zafar H, Whitney SL, Iqbal Z. Effect of chewing on postural stability during quiet standing in healthy young males. *Somatosensory & motor research*. 2014;1-5. *Epub* 2014/10/31.
 12. Shimazaki K, Matsubara N, Hisano M, Soma K. Functional relationships between the masseter and sternocleidomastoid muscle activities during gum chewing. *The Angle orthodontist*. 2006;76:452-8. *Epub* 2006/04/28.
 13. Matsubara N, Hisano M, Minakuchi S, Soma K. Head movements in the occlusal phase of mastication. *Journal of medical and dental sciences*. 2002;49:37-42. *Epub* 2002/08/06.
 14. Hellsing E. Changes in the pharyngeal airway in relation to extension of the head. *European journal of orthodontics*. 1989;114:359-65. *Epub* 1989/11/01.
 15. Rasley A, Logemann JA, Kahrilas PJ, Rademaker AW, Pauloski BR, Dodds WJ. Prevention of barium aspiration during videofluoroscopic swallowing studies: value of change in posture. *AJR American Journal of roentgenology*. 1993;160:1005-9. *Epub* 1993/05/01.
 16. Ertekin C, Keskin A, Kiylioglu N, Kirazli Y, On AY, Tarlaci S, et al. The effect of head and neck positions on oropharyngeal swallowing: a clinical and electrophysiologic study. *Archives of physical medicine and rehabilitation*. 2001;82:1255-60. *Epub* 2001/09/12.
 17. Logemann JA, Pauloski BR, Rademaker AW, Kahrilas PJ. Oropharyngeal swallow in younger and older women: videofluoroscopic analysis. *Journal of speech, language, and hearing research : JSLHR*. 2002;45:434. PubMed -45. *Epub* 2002/06/19.
 18. Adnerhill I, Ekberg O, Groher ME. Determining normal bolus size for thin liquids. *Dysphagia*. 1989;4:1-3. *Epub* 1989/01/01. PubMed
 19. Ertekin C, Aydogdu I, Yuceyar N. Piecemeal deglutition and dysphagia limit in normal subjects and in patients with swallowing disorders. *Journal of neurology, neurosurgery, and psychiatry*. 1996;615:491-6. *Epub* 1996/11/01. PubMed
 20. Ekberg O. Posture of the head and pharyngeal swallowing. *Acta radiologica: diagnosis*. 1986;276:691-6. *Epub* 1986/11/01.
 21. Castell JA, Castell DO, Schultz AR, Georgeson S. Effect of head position on the dynamics of the upper esophageal sphincter and pharynx. *Dysphagia*. 1993;8:1-6. *Epub* 1993/01/01.
 22. Davies S. Dysphagia in acute strokes. *Nurs Stand*. 1999;1330:49-54; quiz 5. *Epub* 1999/07/27. PubMed
 23. Shanahan TK, Logemann JA, Rademaker AW, Pauloski BR, Kahrilas PJ. Chin-down posture effect on aspiration in dysphagic patients. *Archives of physical medicine and rehabilitation*. 1993;74:736-9. *Epub* 1993/07/01.
 24. Bulow M, Olsson R, Ekberg O. Videomanometric analysis of supraglottic swallow, effortful swallow, and chin tuck in healthy volunteers. *Dysphagia*. 1999;142:67-72. *Epub* 1999/02/24.
 25. Welch MV, Logemann JA, Rademaker AW, Kahrilas PJ. Changes in pharyngeal dimensions effected by chin tuck. *Archives of physical medicine and rehabilitation*. 1993;74:178-81. *Epub* 1993/02/01.
 26. Logemann JA, Kahrilas PJ, Kobara M, Vakil NB. The benefit of head rotation on pharyngoesophageal dysphagia. *Archives of physical medicine and rehabilitation*. 1989;70:767-71. *Epub* 1989/10/01.
 27. Ohmae Y, Ogura M, Kitahara S, Karaho T, Inouye T. Effects of head rotation on pharyngeal function during normal swallow. *The Annals of otology, rhinology, and laryngology*. 1998;107:344-8. *Epub* 1998/04/29. PubMed
 28. Logemann JA. Dysphagia: evaluation and treatment. *Folia Phoniatr Logop*. 1995;47:140-64. *Epub* 1995/01/01.
 29. Kahrilas PJ, Logemann JA, Gibbons P. Food intake by maneuver; an extreme compensation for impaired

swallowing. *Dysphagia*. 1992;73:155-9. Epub 1992/01/01. PubMed

30. Logemann JA, Rademaker AW, Pauloski BR, Kahrilas PJ. Effects of postural change on aspiration in head and

neck surgical patients. *Otolaryngology--head and neck surgery : Official Journal of American Academy of Otolaryngology-Head and Neck Surgery*. 1994;1102:222-7. Epub 1994/02/01.