Original article
https://doi.org/10.18019/1028-4427-2025-31-4-471-477

The incidence and risk factors related to post-operative dysphagia after anterior cervical spine surgery: a prospective study

J. Singh, N. Singh, P. Gupta✉, B. Kapil

GGS Medical College and Hospital, Faridkot, Punjab, India

Corresponding author: Pranav Gupta, pranavchd88@gmail.com

Abstract

Introduction Post-surgical dysphagia is one complication particularly common in early postoperative period after Anterior cervical spine surgery (ACSS). However, the pathophysiology of dysphagia after surgery has not been well understood.

This study **aimed** to analyse the frequency and risk factors for developing dysphagia following ACSS and find an effective program to prevent and treat.

Materials and methods A prospective observational study was conducted on 50 patients undergoing ACSS from April 2021 to Oct 2022 at the Department of Orthopedics, Guru Gobind Singh Medical College and Hospital, Punjab (India). Patients were in the age group of 27 to 60 years. The indications for cervical surgeries were traumatic, degenerative, infective and neoplastic involving C2 to C7 vertebra with signs of neural compression unresponsive to conservative treatment. Data on patient age, gender, duration of surgery, intraoperative blood loss, segment operated and the number of segments operated were collected. Follow up time was 24 weeks.

Results Incidence of dysphagia was 20 % (10/50) within first week which reduced to zero at completion of six months of follow-up. Dysphagia was present in 2 % (1/50) patients in age group 21–40 years and 18 % (9/50) patients in age group of 41–60 years. 14.6 % (6/41) males and 44 % (4/9) of females had dysphagia. Prevalence of dysphagia in patients with one affected segment was 9.5 % (4/42), two segments was 80 % (4/5) and three segments was 50 % (1/2). Mean duration of surgery in patients with post-operative dysphagia was 115 mins. Mean blood loss in patients with post-operative dysphagia was 171.40 mL Mean Et (endotracheal) tube cuff pressure in patients with post-operative dysphagia was 24.70 cm H_2O. Within the first week of surgery, there were 10 cases out of which one was mild, six were moderate and three were severe.

Conclusion Despite the fact that some inconsistency is there in the literature regarding risk factors it can be safely concluded from our study that incidence of post-operative dysphagia can be reduced by decreasing blood loss during surgery, reducing surgery time and optimizing Endotracheal tube cuff pressure during surgery.

Keywords: Anterior cervical spine surgery, Blood loss, Cuff pressure, Dysphagia

For citation: Singh J, Singh N, Gupta P, Kapil B. The incidence and risk factors related to post-operative dysphagia after anterior cervical spine surgery: a prospective study. *Genij Ortopedii*. 2025;31(4):471-477. doi: 10.18019/1028-4427-2025-31-4-471-477.

Научная статья
УДК 616.711.1-089.168.1-06:616.321-008.17]-07
https://doi.org/10.18019/1028-4427-2025-31-4-471-477

Частота и факторы риска развития дисфагии после операции на переднем шейном отделе позвоночника: проспективное исследование

J. Singh, N. Singh, P. Gupta✉, B. Kapil

GGS Medical College and Hospital, Faridkot, Punjab, India

Автор, ответственный за переписку: Pranav Gupta, pranavchd88@gmail.com

Аннотация

Введение. Дисфагия — осложнение после операции на переднем шейном отделе позвоночника (*англ.*: anterior cervical spine surgery, ACSS, наиболее распространенное в раннем периоде, патофизиология которого недостаточно изучена.

Цель работы — анализ частоты и факторов риска развития дисфагии после ACSS и поиск эффективной программы ее профилактики.

Материалы и методы. В проспективное наблюдательное исследование включены 50 пациентов (41 мужчина и девять женщин), которым проведены ACSS с апреля 2021 года по октябрь 2022 года в отделении ортопедии Guru Gobind Singh Medical College and Hospital (Пенджаб, Индия). Возраст пациентов — от 27 до 60 лет. Показания к операции: не поддающиеся консервативному лечению травматические, дегенеративные, инфекционные и опухолевые заболевания, затрагивающие позвонки C2–C7, с признаками компрессии нервов. Проанализированы данные: возраст пациента, пол, продолжительность операции, интраоперационная кровопотеря, оперированные сегменты, в том числе их количество. Время наблюдения — 24 недели.

Результаты и обсуждение. Частота возникновения дисфагии составила 20 % (10 пациентов) в течение первой недели и снизилась до нуля по завершении шести месяцев наблюдения. Дисфагия присутствовала у одного (2 %) пациента возрастной группы 21–40 лет и девяти (18 %) пациентов возрастной группы 41–60 лет, у шести (14,6 %) мужчин и четырех (44 %) женщин. Дисфагия у пациентов с одним пораженным сегментом зарегистрирована в 9,5 % случаев (4/42), с двумя сегментами — в 80 % случаев (4/5), с тремя сегментами — в 50 % случаев (1/2). У пациентов с послеоперационной дисфагией средняя продолжительность операции составила 115 минут, средняя кровопотеря — 171,40 мл, среднее давление в манжете эндотрахеальной трубки — 24,70 см H_2O. Среди 10 случаев послеоперационной дисфагии, встретившихся в течение первой недели, один был легким, шесть умеренными и три тяжелыми. В литературе есть некоторая непоследовательность относительно факторов риска послеоперационной дисфагии.

Заключение. Частоту послеоперационной дисфагии можно снизить за счет уменьшения операционной кровопотери, сокращения продолжительности оперативного вмешательства и оптимизации давления в манжете эндотрахеальной трубки во время операции.

Ключевые слова: операция на переднем шейном отделе позвоночника, кровопотеря, давление манжеты, дисфагия

Для цитирования: Singh J., Singh N., Gupta P., Kapil B. Частота и факторы риска развития дисфагии после операции на переднем шейном отделе позвоночника: проспективное исследование. *Гений ортопедии*. 2025;31(4):471-477. doi: 10.18019/1028-4427-2025-31-4-471-477.

INTRODUCTION

Various cervical spine pathologies including trauma and degenerative spinal diseases require Anterior cervical spine surgery (ACSS) [1]. The anterior approach is secure, fruitful, and rate of morbidity and mortality are low. However, a number of complications associated with the anterior approach have been described [2]. Dysphagia is one such complication particularly common in early postoperative period [3]. It is mild to moderate in majority of patients and is transient in nature and resolves gradually within three months of surgery [4, 5]. Its incidence varies in the literature from 1 % to 79 % [6]. Dysphagia can prolong the period of hospital stay and also influence the quality of life of patients in terms of food which patient can eat and difficulty in talking to another person [7]. However, its pathophysiology has not been well understood. There are various factors which lead to dysphagia after ACSS which include operative time, use of instrumentation, design and thickness of plate, extent and duration of intraoperative retraction, endotracheal tube cuff pressure, use of steroids, number of levels operated, revision versus primary surgery leading to wide variation in incidence rates of dysphagia [8]. Other risk factors, such as gender, tobacco consumption, smoking and intraoperative blood loss have also been associated with postoperative dysphagia [9].

This study aimed to analyze the frequency and risk factors for developing swallowing difficulty following anterior cervical spine procedures and find an effective program to prevent and treat. This article was previously posted to the Research Square preprint server on June 13, 2023.

MATERIALS AND METHODS

A prospective observational study was conducted on 50 patients undergoing ACSS from April 2021 to Oct 2022 at the Department of Orthopedics, Guru Gobind Singh Medical College and Hospital, a tertiary care center in Punjab (India). Patients were in the age group of 27 to 60 years and were admitted on first come basis. All patients were assessed clinically based on MRC power grading. Radiologic diagnoses were established in each patient through routine preoperative cervical radiographs and cervical magnetic resonance imaging and computed tomography scans and these were correlated with clinical findings to single out the level of surgery. The indications for cervical surgeries were traumatic, degenerative, infective and neoplastic involving C2 to C7 vertebra with signs of neural compression unresponsive to conservative treatment.

Exclusion criteria were: (i) Patients having preoperative dysphagia; (ii) those with history of previous ACSS; (iii) associated cervical deformity, severe osteoporosis, ankylosing spondylitis and rheumatoid arthritis; (iv) those with history of smoking and tobacco usage.

There were 41 male and 9 female patients in our study with an average age of 49 years. Approval for this study was obtained from the institutional review board. Written informed consent was taken from every patient included in our study. All surgeries were performed at a single institution. All patients were operated under GA which included use of an inflated endotracheal cuff, pressure of which was noted in every surgery. Every individual in this study underwent anterior cervical decompression using Smith-Robinson approach followed by removal of cartilaginous end plates and use of structural autograft bone to achieve fusion followed by anterior plate and screw fixation (Fig. 1, 2). The type of plate was standardized for this study and did not vary from patient to patient except for the length of the plate. Wound was closed over drain which was removed on second postoperative day or when the drain output was less than 30 mL. Postoperatively cervical spine was immobilized in a rigid cervical collar. We recorded the length of each surgical procedure from incision to closure time. Intra operative steroid used was confirmed from anesthetist. On post-operative day one, patient was started on liquid diet and progressed to semi solid and solid food according to patient comfort on consecutive days.

Patients were split into two group, one had patients with postoperative dysphagia and the other did not. Data on patient gender, age, duration of surgery, surgery blood loss, segment operated and the number of segments operated were collected (Table 1). Follow up time was 24 weeks. Post-operative assessment of dysphagia was done within the first week post surgery followed by 12 weeks and 24 weeks by asking the patient at each visit "Do you have any pain, sticky throat feeling or choking when swallowing solid or liquid food?". If the patient responded that they were symptomatic, then further information was obtained to determine the level of severity. The Bazaz grading system is commonly employed to evaluate the severity of dysphagia and so was used in our study [8]. The system defines four grades: none, mild, moderate, and severe dysphagia based on the subjective symptoms. Patients with no episodes of swallowing difficulty were graded as having "none". Patients who experienced rare episodes of dysphagia and did not feel that their dysphagia was a significant problem were graded as "mild". "Moderate" dysphagia was defined as occasional swallowing difficulty with specific foods (ie, bread or meats). "Severe" dysphagia was defined as frequent difficult swallowing with a majority of foods which included liquids (Table 2).

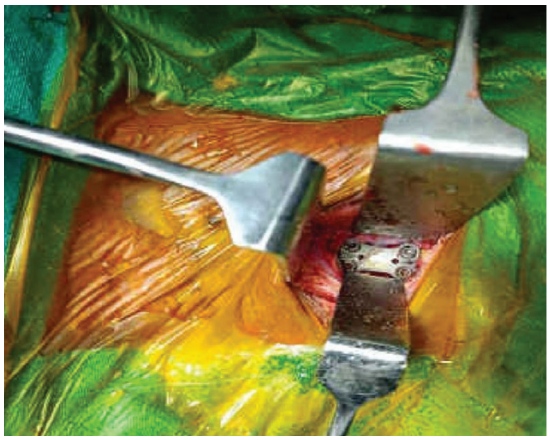

Fig. 1. Illustrating cervical plate positioned at desired level fixed with screws of appropriate length

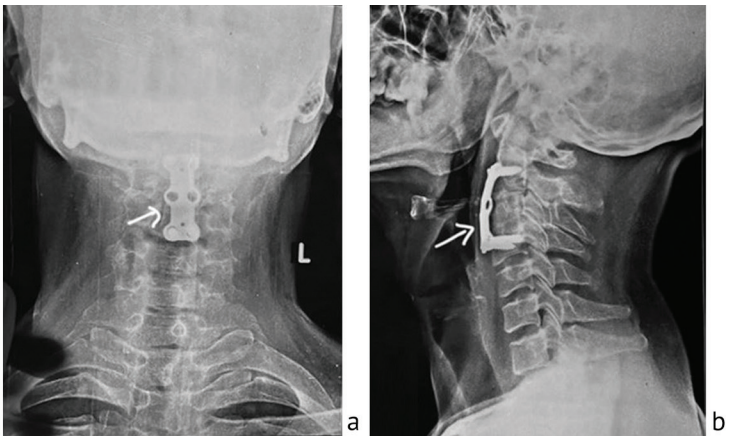

Fig. 2. X-rays of the cervical spine: a — in the direct (anteroposterior); b — lateral projections respectively after ACDF

Table 1

Table showing incidence of post-operative dysphagia with respect to various different parameters

Parameters		Postop Dysphagia Present	Postop Dysphagia Absent	*P* value
Age Group (Years)	21–40	1	14	0.12
	41–60	9	26	
Gender	Male	6	35	0.04
	Female	4	5	
No of levels	1	4	38	0.0001
	2	4	1	
	3	2	1	
Operated Levels	At or above C4–C5	3	13	0.11
	Below C4–C5	1	25	
Mean Duration of Surgery (mins)		91.25	115	0.006
Mean Blood Loss (ml)		130.8	171.4	0.0006
Mean ET tube cuff pressure (cm H_2O)		22.7	24.7	0.000023

Table 2

Table showing grades of post-operative dysphagia with number of dysphagia cases at each follow up

Grades of Dysphagia	No of Cases		
	Within first week	12 weeks	24 weeks
None	40	46	50
Mild	1	1	0
Moderate	6	3	0
Severe	3	0	0

RESULTS

The study included 50 patients. Within first week of surgery, the incidence of dysphagia was 20 % (10/50) which reduced to zero at completion of six months of follow-up. The average age in our study was 49 years. According to age group, dysphagia was present in 2 % (1/50) patients in age group 21–40 years and 18 % (9/50) patients in age group of 41–60 years, but difference was not found to be statistically significant (*P* value = 0.12). Ratio of male to female was 4:1 (40 males, 10 females). 14.6 % (6/41) males and 44 % (4/9) of females had dysphagia and the difference between the two groups was found to be statistically significant (*P* value = 0.04).

According to the number of levels that were operated, prevalence of dysphagia in patients involving one level was 9.5 % (4/42), two levels was 80 % (4/5) and three levels was 50 % (1/2) and the difference between the three groups was found to be statistically significant. (*P* value = 0.0001). To assess if surgical level played a role, we evaluated the prevalence of dysphagia after single-level procedures at C4–5 and above (upper cervical segment) and prevalence of dysphagia after single-level procedures below C4–C5 (lower cervical segment). Patients in which upper cervical segment was operated accounted for 18.8 % (3/16) of dysphagia

cases while patients in which lower cervical segment was operated constituted only 3.8 % (1/26) of cases. Thus, cases were more in patients in which upper cervical segment was involved, however, the difference between the two groups was not found to be statistically significant (*P* value = 0.11).

Similarly, we performed additional statistical analysis to determine association of duration of surgery, blood loss, endotracheal cuff pressure on incidence of dysphagia in immediate postoperative period. Mean duration of surgery in patients with post-operative dysphagia was 115 mins and mean duration of surgery in patients without post-operative dysphagia was 91.25 mins and this difference was significantly higher (*P* value = 0.006). Mean blood loss in patients with post-operative dysphagia was 171.40 mL which was significantly higher than mean blood loss in patients without post-operative dysphagia was 130.8 mL (*P* value = 0.0006).

Mean Et (endotracheal) tube cuff pressure in patients with post-operative dysphagia was 24.70 cm H_2O which was also significantly higher than mean Et tube cuff pressure in patients without post-operative dysphagia which was 22.70 cm H_2O (*P* value = 0.000023).

Severity of dysphagia was also assessed based on the time that has passed after surgery. Within the first week of surgery, there were 10 cases of dysphagia out of which one was mild, six were moderate and three were severe. After 12 weeks, there were one mild, three moderate and zero severe cases of dysphagia. 24 weeks after surgery, prevalence of dysphagia cases was zero. Thus, there was a declining trend in the number of cases of dysphagia as well as severity of cases as the duration of follow up increased (Table 2).

DISCUSSION

Anterior approach to the cervical spine has served well in treating many spinal pathologies from diverse etiologies like degenerative, traumatic, oncologic, inflammatory, and congenital [9]. Although morbidity and mortality rate associated with ACSS is less, dysphagia is very likely to occur [9]. It has been postulated that oesophageal oedema and traction injury of the nerves involved in the swallowing mechanism are to blame [10].

Several studies have reported the risk factors associated with dysphagia after ACSS, but the results showed wide-range of variations and hardly could draw any firm conclusions [10]. Most common factors associated are advanced age (aged > 60 years), female gender, increase number of operated levels and increased operative time [11]. M.J. Lee et al. carried out a study with two years follow up, and found that apart from the above mentioned factors, revision surgeries were also risk factors for dysphagia after ACSS [12].

Older patients (aged > 60 years) are at increased risk for postoperative dysphagia [7]. Although authors of several studies found no correlation between age and dysphagia, study by S. Kalb et al. found that the mean age of dysphagic and nondysphagic patients was significantly different (55 and 50 years, respectively, *P* = 0.05) [9] This could be explained by anatomic and physiological changes seen in elderly patients like weakening of swallowing muscles, decrease in salivary secretions and decrease in elasticity of oesophagus [14]. In our study also, 34.6 % (9/26) of patients in age group 41–60 years had post-operative dysphagia while only 7.1 % (1/14) of patients in age group 21 to 40 years had postoperative dysphagia, however the difference was not statistically significant (*P* value = 0.12).

Gender is another factor found to predispose the patient to dysphagia post cervical spine surgery. In a few studies the prevalence of dysphagia has been greater in women than men as the former have small anatomical structures, weak muscle strength and higher pain sensitivity [4, 9, 15]. In a study by M.J. Lee et al. the frequency of dysphagia was more in females (18.3 %) than males (9.9 %) two years after the surgery [12]. R. Bazaz et al. in his study reported that though the frequency of dysphagia was not significantly different between men and women in the 1–2 months postoperatively, but in the sixth month of follow-up, the incidence was 24.7 % in women, while 11.7 % in men and this difference was significant (*P* = 0.023) [16]. In our study, incidence of dysphagia among females (44.4 % i.e. 4/9) was more compared to males (14.6 % i.e. 6/41) at the first follow-up and the difference was also statistically significant (*P* value = 0.04) thus showing that female gender is a risk factor.

The cervical levels involved have also been evaluated to determine whether they have a part in the occurance of postoperative dysphagia. In upper cervical spine, retropharyngeal space is more than inferior cervical spine due to which soft tissue swelling is more severe, which makes the postoperative dysphagia aggravate [12]. Another reason for increased dysphagia rates in upper cervical spine is that the superior laryngeal nerve sometimes becomes visible when surgical site is at the level of C3/4 or C2/3, due to which chances of causing superior laryngeal nerve damage increases [17]. Chin et al. also found that highest level of plate position at C3 had proportionately increased prevalence of dysphagia than surgery at C4 and below [18]. Many other studies have shown that surgery at a higher level (C3–C4) where there is a smaller soft-tissue envelope would result in increased dysphagia rates [12]. However, study conducted by M.J. Lee et al. did not support these findings [12]. We also studied the difference in frequency of dysphagia cases post single-level procedures

at upper and lower cervical segment. Patients in which upper cervical segment was operated, prevalence of dysphagia was 18.8 % (3/16) while patients in which lower cervical segment was operated, prevalence was 3.8 % (1/26), however the difference was not statistically significant (*P* value = 0.11).

In comparative studies conducted after ACSS, post-operative dysphagia was commonly seen with multiple level surgeries as it increases retraction time, prolongs surgery time and leads to more soft tissue swelling [5]. Similarly in a study by S. Kalb et al. on an average, dysphagic patients had 2.2 levels operated as opposed to 1.84 in non dysphagic patients [9]. L.H. Riley et al. found that incidence of postoperative dysphagia in the patients with two or three surgical segments were higher than one segment [1]. In study by M.J. Lee et al., prevalence ratio suggested that patients with surgery at three or more levels are almost twice as likely to experience long-term dysphagia than patients with surgery at less than three levels [12]. M.J. Lee et al. and R. Bazaz et al. found that patients who underwent ACSS at multiple level had a significant risk of swallowing difficulty in contrast to those who underwent surgery at single-level at four and eight weeks follow-up [12, 16]. A. Frempong-Boadu et al. too showed that ACSS done at multiple level showed an increased frequency of postoperative swallowing difficulty as compared to those who underwent single level surgery [19]. In the present study, swallowing abnormality was present in 9.5 % (4/42) of patients operated at single level, 80 % (4/5) of patients operated through two levels and 50 % (1/2) of patients operated through 3 levels and the difference between the three groups was found to be statistically significant (*P* value = 0.0001).

Time span of procedure was another factor which was examined in this study. Increased duration of surgery leads to traction on trachea and esophagus for extended duration which makes soft tissue swelling escalate. Therefore, the incidence of post-operative dysphagia rises [20]. In a study by A. Yoshizawa et al. duration of surgery more than 200 min was associated with post-operative dysphagia [21]. In a similar study by R. Xue et al. more operation time (*P* value = 0.012) was associated with increased prevalence of post-operative dysphagia [21]. In our study, mean duration of surgery in patients with post-operative dysphagia was 115 mins which was significantly higher than mean duration of surgery in patients without post-operative dysphagia was 91.25 mins (*P* value = 0.006).

Blood loss during surgery is another risk factor whose association with dysphagia was looked for. In a study conducted by A. Yoshizawa et al. blood loss more than 100 ml was associated with post-operative dysphagia [21]. In a similar study by L.H. Riley et al. blood loss superior to 300 ml was associated with an enhanced risk of dysphagia following ACSS [1]. In our study, mean blood loss in patients with post-operative dysphagia was 171.40 ml which was significantly higher compared to patients without post-operative dysphagia in which postoperative blood loss was 130.84 ml (*P* value = 0.0006).

Observing the endotracheal tube cuff pressure is recommended during ACSS [22]. Keeping the pressure between 15 and 25 cm H_2O is considered important for preventing post-surgical dysphagia [23]. Pressures below 15 cm H_2O can lead to gas leakage and aspiration, while pressures more than 25–30 cm H_2O may cause decrease in tracheal wall capillary blood flow leading to mucosal ischemia, tracheomalacia, tracheal stenosis, tracheal rupture, and tracheoesophageal fistula due to a [23]. In the study by Ural et, risk of developing post-surgical dysphagia significantly decreased with an endotracheal cuff pressure of 20 cm H_2O compared to 25 cm H_2O [3]. G. Grasso et al. reported a significant reduction in the rate of early dysphagia when the cuff pressure was reduced [24]. In our study, mean Et tube Cuff pressure in patients with post-operative dysphagia was 24.70 cm H_2O which was significantly more than mean Et tube cuff pressure in patients without post-operative dysphagia which was 22.70 cm H_2O (*P* value 0.000023). Thus, mean Et tube cuff pressure is an essential risk factor to be taken care of during ACCS.

Swallowing difficulties after ACSS are usually transient in nature. J.A. Rihn et al found that the prevalence of dysphagia had declined to 8 % at 12 weeks [5]. Similarly, R.Bazaz et al. reported that the frequency decreased to 50.2 % at one month post-operatively, and decreased further to 32.2 %, 17.8 % and 12.5 % by two, six and twelve months postoperatively, respectively [16]. A prospective study by M.J. Lee et al. found a similar decreasing incidence of 54.2 %, 33.6 %, 18.6 %, and 13.6 % at one, two, six and 12 months postoperatively, respectively [12]. Our own study observed an initial incidence of dysphagia of 20 % within the first week after surgery, which subsequently decreased to 8 % at the 12 week mark and zero at 24 weeks which is comaparable to the above-mentioned studies. Thus prevalence of dysphagia following ACSS was high initially, but gradually decreased in both incidence and severity over time, indicating it as a common early complication.

However, there are several limitations in this study. Firstly, the study had a limited sample size due to which accuracy and efficacy of our results on dysphagia assessment were not high enough. A randomized control studies with a larger sample size and a long-term follow-up is necessary to further determine the outcomes. Secondly, the dysphagia was reported just basing on the subjective feeling of patients, which may not be completely reliable as it is not a universally accepted method for determining and measuring dysphagia. Moreover in our study we had majority of patients with single level operated. This selection bias could be eliminated by more randomized controlled studies in future.

CONCLUSION

Discomfort in swallowing after ACSS is a relatively usual phenomenon within the first week of surgery. It is, nevertheless temporary with maximum number of cases settling within 3 months. Despite the fact that some inconsistency is there in the literature regarding risk factors it can be safely concluded from our study that incidence of post-operative dysphagia can be reduced by decreasing blood loss, reducing surgery time and optimizing Endotracheal tube cuff pressure during surgery.

Conflict of interest *Not declared.*

Funding *Not declared.*

REFERENCES

1. Riley LH 3rd, Vaccaro AR, Dettori JR, Hashimoto R. Postoperative dysphagia in anterior cervical spine surgery. *Spine (Phila Pa 1976)*. 2010;35(9 Suppl):S76-85. doi: 10.1097/BRS.0b013e3181d81a96.
2. Joaquim AF, Murar J, Savage JW, Patel AA. Dysphagia after anterior cervical spine surgery: a systematic review of potential preventative measures. *Spine J*. 2014;14(9):2246-2260. doi: 10.1016/j.spinee.2014.03.030.
3. Ural SG, Tor IH. Effects of different endotracheal tube cuff pressures on dysphagia after anterior cervical spine surgery. *Cukurova Med J*. 2022;47(2):614-621. doi: 10.17826/cumj.1049742.
4. Yue WM, Brodner W, Highland TR. Persistent swallowing and voice problems after anterior cervical discectomy and fusion with allograft and plating: a 5- to 11-year follow-up study. *Eur Spine J*. 2005;14(7):677-682. doi: 10.1007/s00586-004-0849-3.
5. Rihn JA, Kane J, Albert TJ, et al. What is the incidence and severity of dysphagia after anterior cervical surgery? *Clin Orthop Relat Res*. 2011;469(3):658-665. doi: 10.1007/s11999-010-1731-8.
6. Cho SK, Lu Y, Lee DH. Dysphagia following anterior cervical spinal surgery: a systematic review. *Bone Joint J*. 2013;95-B(7):868-873. doi: 10.1302/0301-620X.95B7.31029.
7. Tsalimas G, Evangelopoulos DS, Benetos IS, Pneumaticos S. Dysphagia as a Postoperative Complication of Anterior Cervical Discectomy and Fusion. *Cureus*. 2022;14(7):e26888. doi: 10.7759/cureus.26888.
8. Anderson KK, Arnold PM. Oropharyngeal Dysphagia after anterior cervical spine surgery: a review. *Global Spine J*. 2013;3(4):273-286. doi: 10.1055/s-0033-1354253.
9. Kalb S, Reis MT, Cowperthwaite MC, et al. Dysphagia after anterior cervical spine surgery: incidence and risk factors. *World Neurosurg*. 2012;77(1):183-187. doi: 10.1016/j.wneu.2011.07.004.
10. Rieger A, Brunne B, Hass I, et al. Laryngo-pharyngeal complaints following laryngeal mask airway and endotracheal intubation. *J Clin Anesth*. 1997;9(1):42-37. doi: 10.1016/S0952-8180(96)00209-7.
11. Chaudhary SK, Bin Y, Fumin P, et al. Postoperative dysphagia as a complication of anterior cervical spine surgery. *Int J Curr Research*. 2017;9(5):51365-51372.
12. Lee MJ, Bazaz R, Furey CG, Yoo J. Risk factors for dysphagia after anterior cervical spine surgery: a two-year prospective cohort study. *Spine J*. 2007;7(2):141-147. doi: 10.1016/j.spinee.2006.02.024.
13. Liu JM, Tong WL, Chen XY, et al. The incidences and risk factors related to early dysphagia after anterior cervical spine surgery: A prospective study. *PLoS One*. 2017;12(3):e0173364. doi: 10.1371/journal.pone.0173364.
14. Wirth R, Dziewas R, Beck AM, et al. Oropharyngeal dysphagia in older persons - from pathophysiology to adequate intervention: a review and summary of an international expert meeting. *Clin Interv Aging*. 2016;11:189-208. doi: 10.2147/CIA.S97481.
15. Zeng JH, Zhong ZM, Chen JT. Early dysphagia complicating anterior cervical spine surgery: incidence and risk factors. *Arch Orthop Trauma Surg*. 2013;133(8):1067-1071. doi: 10.1007/s00402-013-1773-y.
16. Bazaz R, Lee MJ, Yoo JU. Incidence of dysphagia after anterior cervical spine surgery: a prospective study. *Spine (Phila Pa 1976)*. 2002;27(22):2453-2458. doi: 10.1097/00007632-200211150-00007.
17. Wu B, Song F, Zhu S. Reasons of Dysphagia After Operation of Anterior Cervical Decompression and Fusion. *Clin Spine Surg*. 2017;30(5):E554-E559. doi: 10.1097/BSD.0000000000000180.
18. Chin KR, Eiszner JR, Adams SB Jr. Role of plate thickness as a cause of dysphagia after anterior cervical fusion. *Spine (Phila Pa 1976)*. 2007;32(23):2585-2590. doi: 10.1097/BRS.0b013e318158dec8.
19. Frempong-Boadu A, Houten JK, Osborn B, et al. Swallowing and speech dysfunction in patients undergoing anterior cervical discectomy and fusion: a prospective, objective preoperative and postoperative assessment. *J Spinal Disord Tech*. 2002;15(5):362-368. doi: 10.1097/00024720-200210000-00004.
20. Xue R, Ji ZY, Cheng XD, et al. Risk Factors for Dysphagia after Anterior Cervical Discectomy and Fusion with the Zero-P implant system: A Study with Minimum of 2 Years Follow-up. *Orthop Surg*. 2022;14(1):149-156. doi: 10.1111/os.13170.
21. Yoshizawa A, Nakagawa K, Yoshimi K, et al. Analysis of swallowing function after anterior/posterior surgery for cervical degenerative disorders and factors related to the occurrence of postoperative dysphagia. *Spine J*. 2023;23(4):513-522. doi: 10.1016/j.spinee.2022.12.010.
22. Ratnaraj J, Todorov A, McHugh T, et al. Effects of decreasing endotracheal tube cuff pressures during neck retraction for anterior cervical spine surgery. *J Neurosurg*. 2002;97(2 Suppl):176-179. doi: 10.3171/spi.2002.97.2.0176.
23. Hockey CA, van Zundert AA, Paratz JD. Does objective measurement of tracheal tube cuff pressures minimise adverse effects and maintain accurate cuff pressures? A systematic review and meta-analysis. *Anaesth Intensive Care*. 2016;44(5):560-570. doi: 10.1177/0310057X1604400503.
24. Grasso G, Leone L, Torregrossa F. Dysphagia Prevention in Anterior Cervical Discectomy Surgery: Results from a Prospective Clinical Study. *World Neurosurg*. 2019;125:e1176-e1182. doi: 10.1016/j.wneu.2019.01.273.

The article was submitted 18.02.2025; approved after reviewing 31.03.2025; accepted for publication 05.06.2025.

Статья поступила 18.02.2025; одобрена после рецензирования 31.03.2025; принята к публикации 05.06.2025.

Information about the authors:

Jagdeep Singh — Associate Professor (Orthopaedics), jagatwal83@gmail.com, https://orcid.org/0000-0002-1508-2745;

Navpreet Singh — Junior Resident (Orthopaedics), Navpreetsingh66@gmail.com;

Pranav Gupta — Assistant Professor (Orthopaedics), pranavchd88@gmail.com; https://orcid.org/0000-0003-4936-1950;

Bansal Kapil — Professor (Orthopaedics), kapilortho@gmail.com.