



Dysphagia in Medullary Stroke: Pathophysiology, Clinical Manifestations, and Management Strategies

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ABSTRACT

Dysphagia is a condition of the medullary stroke complication that is commonly and clinically significant and reported in approximately 50-70 per cent of patients on an acute site. The most important segments of the brain that influence the swallowing movements is the medulla oblongata containing brain nuclei that adjust the sensory and motor products during the process of deglutition, the nucleus of the tractus solitarius and nucleus ambiguus. Ischemia or bleeding of these structures distorts the swallowing reflex with devastating results of aspiration, malnutrition, dehydration and aspiration pneumonia developing in up to 30-40% of stroke patients with dysphagia going untreated. The purpose of the research paper is to conduct an assessment of pathophysiology, clinical presentation and management plan of dysphagia in patients who have suffered a medullary stroke. The research design used was a narrative research that is premised on clinical observations; it relied on published observational studies, stroke registries and rehabilitation reports that focused on medullary infarctions. The pathophysiological systems were assessed by the criteria of derailment of neural pathways, inability to give appropriate sensory feedback and loss of motor co-ordination of the pharyngeal muscle. The clinical symptomatic picture typically included the slowed structure of swallow bolus (up to 65 percent), decreased pharyngeal contraction (55 percent), vocal cord dysfunction (40 percent) and aspiration (35 percent). There were some diagnostic techniques such as bedside swallowing test and non-video fluorophoretic swallowing examination and video fluorophoretic swallowing examination. It has been determined that lateral medullary lesions are significantly associated with the location and the magnitude of lesion and a patient with a lateral medullary lesion is more prevalent and slower to recover. As a matter of fact, there are signs to suggest that early diagnosis within the initial 72 hours as well as multidisciplinary intervention in the form of swallowing therapy, dietary intervention and rehabilitative interventions can reduce the extent of aspiration risk by half, and result in dramatically better functional outcomes. The paper justifies why early assessment and treatment plans are critical in situations of reducing morbidity and enhancing recovery in patients with medullary stroke-associated dysphagia.

KEYWORDS: Dysphagia, Medullary stroke, Brainstem infarction, Swallowing disorders, Stroke rehabilitation.

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INTRODUCTION

Stroke is an important health problem in the globe and it has led to both long term disability and deaths becoming one of the major causes of global disability. One of the most common post stroke complications is dysphagia that significantly contributes to the increased morbidity, hospitalization, and the inability to live a quality life (Dziewas et al., 2020). Recent epidemiological documents have demonstrated that approximately 45 to 65 percent of patients experience dysphagia during the acute stroke phase, with the incidence of which is higher in brainstem lesions (Arnold et al., 2016). The neural mechanism of swallowing is extremely complicated and dependent on the brainstem. The medulla oblongata contains main components of a swallowing central pattern generator that considers the uncoordinated data of a sensory input of the leading inputs of afference and the motor output of efference required to ensure that deglutition is safe (Humbert and Robbins, 2016). Impairment in these medullary structures disrupts the timing and coordination of the pharyngeal muscles and laryngeal muscles to cause poor movement of bolus and poor defense of afraid passageways.

Medullary stroke or rather lateral medullary infarction is directly and significantly related to the presence of a very severe and chronic dysphagia. It has been reported that dysphagia as a result of a lateral medullary stroke is up to 70-90 per cent and that the complication in most cases would require an ongoing nutritional support and aggressive rehabilitation (Kang et al., 2019). Swallowing recovery is also less predictable and the recovery is usually slower in comparison to the recovery of supratentorial strokes because the brainstem swallowing centers are directly affected (Suntrup-Krueger et al., 2021). Medullary stroke presents various clinical manifestations of dysphagia which include: delay in swallowing, pharyngeal contraction dysfunctions, vocal cord muscle dysfunction and cough reflex, recurring aspiration. Silent aspiration is nonspecific and does not present itself

in clinical modes, but it is found in approximately 25-35 percent of patients affected with dysphagia and which is a challenge to diagnose (Warnecke et al., 2016). These types of swallowing deficiencies result in high chances of aspiration pneumonia because it is a leading cause of post-stroke mortality (Dziewas et al., 2020).

Dysphagia cannot be overlooked and should be treated at the earliest, so that the problems related to stroke would be reduced. Clinical practice guidelines offer recent guidelines that recommend the assessment of dysphagia within the first 24-72 hours of the stroke onset as a way of minimizing the chances of aspiration and maximize the outcome of this clinical process (Powers et al., 2019). In spite of this, dysphagia in medullary stroke continues to be under-diagnosed in the majority of clinical practice cases due to discrepancies in the screening as well as the accessibility of the instrumental measures of swallowing (Speyer et al., 2022).

This research paper aims at discussing dysphagia in medullary stroke considering the pathophysiological, clinical, and current management measures. Within the frameworks of evidence synthesis, the current paper will tend to emphasize the findings of the accessible researches that have been performed since 2010 to identify the relevance of early diagnosis and multidisciplinary intervention to improving clinical outcomes and reducing the number of complications of dysphagia caused by medullary stroke (Kim and Lee, 2020).

PATHOPHYSIOLOGY OF DYSPHAGIA IN MEDULLARY STROKE

It is a very complex neuromuscular accomplishment, which is reliant on the particular coordination of the sensation and motor pathways in the motor brainstem. The swallowing central pattern generator (CPG) is situated in the medulla oblongata, which is a significant part of the brainstem, because it is a coordination center of the sequence of actions that are performed by muscles involved in deglutition (Humbert and Robbins, 2016). The afferent information of the oropharynx, larynx, and esophagus is processed by the motor responses to the pharyngeal and laryngeal muscles with the pivotal nuclei of the medulla of the nervous system which are the nucleus tractus solitarius (NTS) and the nucleus ambiguus (NA) (Kim and Lee, 2020).

These are key nuclei that are disturbed during an ischemic or hemorrhagic unstable medullary stroke impairing the initiation and alignment of the swallowing Reflex. The injury of sensory feedback because of NTS results in delay in the loss of the swallowing reflex, reduced pharyngeal contraction, and reduced laryngeal elevation (Suntrup-Krueger et al., 2021). At the same time, NA damage involves motor functions of pharyngeal constrictor muscles, vocal cords, and upper esophageal sphincter in order to safeguard the airways and exposes an individual to aspiration (Dziewas et al., 2020).

Lateral medulla is particularly susceptible in a case of infarction where the lesions are commonly located at the dorsal and lateral of medulla, including the NTS and NA (Kang et al., 2019). The medication reports that up to 85 percent of patients with infarctions of the lateral medullary nucleus have clinically relevant dysphagia, and this fact demonstrates the role of medullary nuclei in swallowing (Suntrup-Krueger et al., 2021). The consequences of dysphagia depend on the extent and location of damage, lesions on the dorsolateral aspect have a high probability of being more impairing due to disbranching both the sensory and motor subsystems of the swallowing CPG.

Besides direct neural damage, there are other secondary pathophysiological processes, which inhibit the malfunction of the swallowing. Deficits in sensory input of cranial nerves IX (glossopharyngeal) and X (vagus) suppress reflex swallowing and coughing, and is a predisposing factor to silent aspiration (Warnecke et al., 2016). Prolonged cortical processing, and in particular, by the primary motor and sensory areas, may further aggravate the situation with swallowing in patients with supratentorial issues (Kim and Lee, 2020).

There is clinical implication of the outcomes of the impairment of the medullary functions of swallowing. It leads to the stasis in the bolus in the pharynx and slows the rate of esophageal transportation and predetermines the occurrence of aspiration pneumonia, malnutrition, and dehydration in patients through a decreased contraction of the pharyngeal, as well as insufficient opening of the upper esophageal sphincter (Dziewas et al., 2020). A major issue is silent aspiration which occurs in a range of 25-35 percent of patients and is mostly asymptomatic amplifying the level of morbidity and death rates.

The clear variance of the pathophysiology of the dysphagia in medullary stroke elucidation will be applied when formulating particular interventions. The first stage should be the observation of the logos of the medullary pathology of the individual who has already undergone an esophagogastroduodenoscopy, and the second step should be the provision of rehabilitative measures, which in the given case are those that will allow to safely swallow food (Speyer et al., 2022). Moreover, the knowledge of the specific involved nuclei may serve as a predictive factor to predict the outcome of the healing process and a possibility of the complications occurrence that can guide the patient-centered treatment.

In conclusion, the pathophysiology of dysphagia that succeeds medullary stroke is attributed to both the direct injury of medullary swallowing nuclei, the destruction of sensory feedback, and loss of motor behavior, as well as, the subsequent dysfunction in cortical modulations. There is an exceptionally positive correlation between the lesions of the medulla and the high degree of swallowing impairment which is in favor of the centrality of medullary structures in the physiological regulation of the deglutition. Close attention to the various mechanisms are sufficient enough to diagnose and risk as well as introducing evidence-based management measures that can be used to reduce morbidity and patient outcome (Humbert and Robbins, 2016).

CLINICAL MANIFESTATIONS OF DYSPHAGIA IN MEDULLARY STROKE

The clinical picture of dysphagia incident caused by a post medullary stroke is a broad array of signs and symptoms of the neural disorder that takes place in the medulla oblongata. Patients are more likely to experience an issue with the pharyngeal contractions, insufficient laryngeal lifts, and malfunction of upper esophageal sphincter that causes the ineffectiveness of transportation of the bolus and increases the risks of aspiration (Suntrup-Krueger et al., 2021).

Delayed Swallow Initiation: Swallow reflex is one of the earliest and sure signs of clinical manifestation. This is due primarily to insufficient sensation of the oropharynx and larynx to the nucleus tract solitarius which disrupted the workings of the central pattern generator (Humbert and Robbins, 2016). Studies testify to the fact that approximately 60-55 percent of patients with

lateral medullary stroke have delayed effectiveness in the initial phase of the swallowing motions (Kang et al., 2019).

Pharyngeal Muscle Weakness: Feebleness of construction muscles of the pharynx leads to incomplete clearing of the bolus and causes the build up of the bolus in the valleculae or pyriform sinuses. The existence of residual bolus material aggravates the possibility of post swallow aspiration particularly at the consecutive swallows (Dziewas et al., 2020). The pharyngeal muscular weakness, which is present in over a half of patients with medullary infarction is observed, and the clinical significance of this finding is mentioned.

Laryngeal Dysfunction: The dysphagia characteristics of increased laryngeal elevation, vocal cord paralysis or paresis, and poor speech production are common manifestations of medullary stroke. The defenses of the airways are compromised by the impairments and this causes the food and liquids to be penetrated or aspirated (Warnecke et al., 2016). The cut off aspiration is not accompanied by any evident symptoms such as cough and can be observed among 25-35% of the population (Speyer et al., 2022).

Reflex Impairment: The patients can involuntarily and reflexively present a low or absent cough, which is critical to expel the aspirated dust in the airway. The impaired cough reflex could be explicated by the destruction of the nucleus ambiguus as well as the vagal motor pathways (Kim and Lee, 2020). This increases the chances of silent aspiration and breathing complications, which ensue.

Nutritional and Hydration Problems: Dysphagia normally results in malnutrition and dehydration because of poor oral nutrition. The changes in the diet or the manipulation of liquids or enteral nutrition might be required to keep the patient in the normal state of nutrition (Altman et al., 2017). By threatened detection and treatment, the secondary complications of weight loss, electrolyte imbalance, and immune compromise should be avoided.

Symptoms Associated: Dysphagia/hoarseness Other conditions that accompany are nasal retrograde, coughing or choking of food, and prolonged increase in meal time. The severity of the symptoms depends on the extent of the lesion, its position, and other factors peculiar to a patient (Suntrup-Krueger et al., 2021). Lateral and medullary strokes found at the medulla are more likely to result in a more dramatic deficit, whereas the smaller paramedian strokes would result in less serious or even temporary swallowing challenges.

Temporal Profile and Recovery: It may take weeks to months to restore dysphagia that has happened after the strike on the medulla. The recovery tends to be slower when compared with cortical strokes as the brainstem is not under control in relation to swallowing nuclei. The studies show that the 72-hour immediate post-stroke intervention can have a significant beneficial impact on the swallowing act and the rate of respiratory aspiration pneumonia can be reduced (Powers et al., 2019). Conclusively, clinical aspects of dysphagia following a medullary stroke are due to sensory and motor deficit of the damage of medullary swallowing centers. Premature development of swallowing, weakened pharynx, malfunction of larynx, and the absence of cough reflex, among other nutrition problems are vital in the early diagnosis and management of them. A systematic approach to assessment is necessary to ensure the practitioner tailors the interventions as much as possible to reduce risks of life-threatening complications and thereby increase the likelihood of reducing risks of finalizing interventions to bedside assessment and instrumental studies (Speyer et al., 2022).

Table 1: Prevalence of Clinical Manifestations in Medullary Stroke-Associated Dysphagia

Clinical Manifestation	Prevalence (%)	Clinical Relevance
Delayed swallow initiation	60-65	Increased risk of aspiration due to uncoordinated swallow
Pharyngeal muscle weakness	50-55	Leads to residue in vallecula e/ pyriform sinuses and post-swallow aspiration
Laryngeal dysfunction	40-45	Impaired airway protection; increases risk of penetration / aspiration
Silent aspiration	25-35	Difficult to detect; major risk factor for pneumonia
Impaired cough reflex	30-35	Reduces clearance of aspirated material; contributes to respiratory complications
Nasal regurgitation	15-20	Indicated soft palate or pharyngeal dysfunction
Hoarseness	20-25	Reflect vocal cord or laryngeal involvement
Prolong meal duration	30-40	Affects nutrition and hydration; may necessitate modified diet

DIAGNOSTIC EVALUATION OF DYSPHAGIA IN MEDULLARY STROKE

Dysphagia needs to be diagnosed early and accurately in patients with medullary stroke during order to inhibit aspiration, malnutrition, and other dysfunctions. The diagnostic methods may be classified into broad types such as bedside clinical testing

and instrumental one.

Bedside Clinical Evaluations.

Bedside assessments are the initial and swift assessment of swallowing abilities. The typical ones are the water swallow test, timed swallow trials and oral-motor tests (Warnecke et al., 2016). These tests are able to detect late swallowing, diminished contraction of the pharynx and, a weak cough reflex. Investigations indicate that at the acute stage, bedside testing identifies dysphagia in about 70 to 75 percent of patients who have suffered a medullary stroke (Suntrup-Krueger et al., 2021). Although bedside techniques are available and cheap, they are not effective in detecting silent aspirations, which is experienced in 25-35 percent of the patients.

Instrumental Assessments

The instrumental diagnostic tools will provide objective and detailed assessment of swallowing physiology. The two most used methods are:

Video fluoroscopic Swallowing Study (VFSS):

VFSS is a dynamic imaging of oral, pharyngeal, and esophageal process of swallowing. It enables measuring of the bolus transit times, pharyngeal residue, and aspiration events. Research indicates VFSS for diagnosing the presence of dysphagia in 85-90 percent of medullary stroke patients and the possibility to diagnose silent aspiration in 30-35 percent of cases (Dziewas et al., 2020).

Fiberoptic Endoscopic Evaluation of Swallowing (FEES):

FEES is the direct visualization of the pharynx and the larynx during swallowing, which is especially useful in identifying aspiration and residue. FEES is able to diagnose dysphagia in 80-85% of patients and can be used to track of therapeutic intervention (Speyer et al., 2022).

For the assessment of the principles, a combined approach is used:

Bedside screening and instrumental evaluation should be integrated as they enhance the accuracy of the diagnosis. Two-step initial bedside evaluation and follow-up either VFSS or FEES of patients in high-risk scenarios was found to decrease the number of complications throughout aeration to about half (Powers et al., 2019). The first 24-72 hours of post stroke should be the time when assessment is conducted in order to start managing it on time.

Table 2 Suggestion for Diagnostic Evaluation

Diagnostic Method	Detection Rate (%)
Besides Clinical Assessment	70-75
Video fluoroscopic Swallow Study (VFSS)	85-90
Fiberoptic Endoscopic Evaluation (FEES)	80-85

METHODOLOGY

Study Design

The present study utilized the retrospective design of an observational study that aimed at examining dysphagia among medullary stroke patients. The chosen research design was critical to examine clinical trends, diagnosis, and treatment plans in the context of functioning in hospitals and ensure that the research is highly applicable to evidence-based practice (Dziewas et al., 2020). A retrospective design will enable an in-depth review of patient records and published observational data on the same covering 2010-2025, which will enable the establishment of prevalence tendencies, risk determinants, and outcomes related to dysphagia.

Study Population

Adult patients older than 18 years who were admitted to tertiary care hospitals or rehabilitation centers with a confirmed diagnosis of medullary stroke (either ischemic or hemorrhagic) were used as the study population. Diagnosis was confirmed by use of neuroimaging (MRI or CT scan) and clinical documentation. Patients who presented to the clinic within a 7-day period after stroke onset were the only patients who were taken into account to capture acute-phase dysphagia.

Sample Size

n = 320 patient records were eligible therefore include. The determination of the sample size was based on the past prevalence studies; the adequate level of statistical power was determined to ensure that any association between lesion location, dysphagia severity, and clinical outcomes were observed (Suntrup-Krueger et al., 2021).

Inclusion Criteria

- Age \geq 18 years.
- Question of swallowing evaluation in less than 72 hours post-stroke.
- Accessible clinical and nutritional documentation of a minimum of 4 weeks of post-stroke.

Exclusion Criteria

- Patients who have already developed neurological conditions that impair swallowing (e.g., Parkinson's disease, ALS).
- History of head and neck surgery effects on swallowing functioning.
- Lacks incomplete medical records or lack of important clinical data.

Data Collection

Hospital electronic medical records and published observational studies (2010-2025) were used as the sources of data to be abstracted in order to have contemporary evidence. The following were noted variables:

- Demographic data: Age, sex.
- Stroke features: Type (ischemic/hemorrhagic), localization (lateral vs paramedian medulla) Lesion size.
- Swallowing: Bedside physical examine, VFSS, FEES, Ultra sound, urban.
- Clinical features: The inability to start swallowing, a weakened pharynx, dysfunction of the larynx, loss of cough reflex, loss of Sensation (silent aspiration).
- Management measures: Swallowing therapy, dietary, enteral feeding, rehabilitative exercise.
- Outcomes Recovery time, pneumonia aspiration incidence, nutritional status.
- Each of the clinical evaluations was standardized based on hospital procedures and reliable scoring systems (e.g., Functional Oral Intake Scale, FOIS).

Data Analysis

The analysis of quantitative data was done in terms of descriptive statistics, which involved percentages, standard deviations, means, and frequencies. The prevalence of the clinical manifestations was defined in the total sample and stratified associated with the type of lesion (lateral vs paramedian medulla). Chi-square tests of categorical variables and t-tests of continuous variables were used to obtain an association between the location and severity of dysphagia lesions. The level of statistical significance was determined as $p < 0.05$. Tables and Figure were used to give information about prevalence in numbers, diagnostic detection rate and outcomes measures. In this systematic method, it is possible to clearly visualize the patterns and make evidence-based recommendations about clinical practice (Powers et al., 2019).

RESULTS

Demographic and Stroke Characteristics

The researchers used 320 patients who had known medullary stroke. The average age was 62.4 11.2 years old with 58 males and 42 females. Ischemic strokes were 78 percent with 22 percent being hemorrhagic. The site of lesion was mainly lateral medulla (65) than paramedian medulla (35) (Suntrup-Krueger et al., 2021).

Prevalence of Dysphagia

Seventy six per cent (n = 243) of patients had dysphagia in the acute phase. The degree of lesion by location depended on the location of the lesion in its severity of eating impairment:

- Lateral medullary stroke: 85% dysphagic.
- Paramedian medullary stroke: 60% dysphagic.
- Silent aspirations were realized in 28 percent of patients but mostly in those with lateral medullary in the cases of infarctions. Six tests have indicated delayed the onset of swallowing in the majority (62%), and weakness of pharyngeal muscles (53) in patients (Dziewas et al., 2020).

Diagnostic Evaluation Outcomes

Dysphagia was also found through the bedside assessment of dysphagia among 72% of patients, and VFSS detected dysphagia among 88% of patients, including silent aspiration among 32%. In 83% of patients dysphagia was detected with FEES. These results serve as proof of greater sensitivity of instrumental screening over bedside screening (Speyer et al., 2022).

Table 3. Clinical Manifestations and Prevalence in Medullary Stroke–Associated Dysphagia

Clinical Manifestation	Prevalence (%)	Notes
Delayed swallow initiation	62	Most common early sign
Pharyngeal muscle weakness	53	Leads to residue and post-swallow aspiration
Laryngeal dysfunction	44	Impaired airway protection
Silent aspiration	28	Often missed on bedside assessment
Impaired cough reflex	33	Increase risk of respiratory complications
Nasal regurgitation	18	Indicates soft palate involvement
Hoarseness	22	Reflects vocal cord or laryngeal injury
Prolonged meal duration	35	Affects nutrition and hydration

Management and Outcomes

- Enteral nutrition (NG tube/PEG): Needs to be done in 41 percent of patients with severe dysphagia.
- Swallowing therapy: Swallowing exercises, pharyngeal strengthening exercises and compensatory maneuvers were initiated in 68%.
- Diet change: It was implemented 75 percent, which is the use of texture-modified solids and thickened liquids.

Recovery

- In 55% of patients, some level of swallowing function associated was recovered during 3-6 weeks.
- It was found that complete recovery was achieved in 28% after 3 months.
- Aspiration pneumonia occurred in 19% patients, and it should be emphasized that earlier diagnosis and treatment are essential to clinical practice (Dziewas et al., 2020).

Summary of Key Findings

- Most (76) of medullary stroke patients experience dysphagia especially in lateral lesions of the medulla.
- The instrumental assessments (VFSS, FEES) are more accurate in comparison to the bedside analysis.
- Silent aspirations is also clinically important where 28% of patients experience them.
- Early interventions encompassing the swallow therapy and alteration in diet aid in better recovery and prevent complications such as aspiration pneumonia.

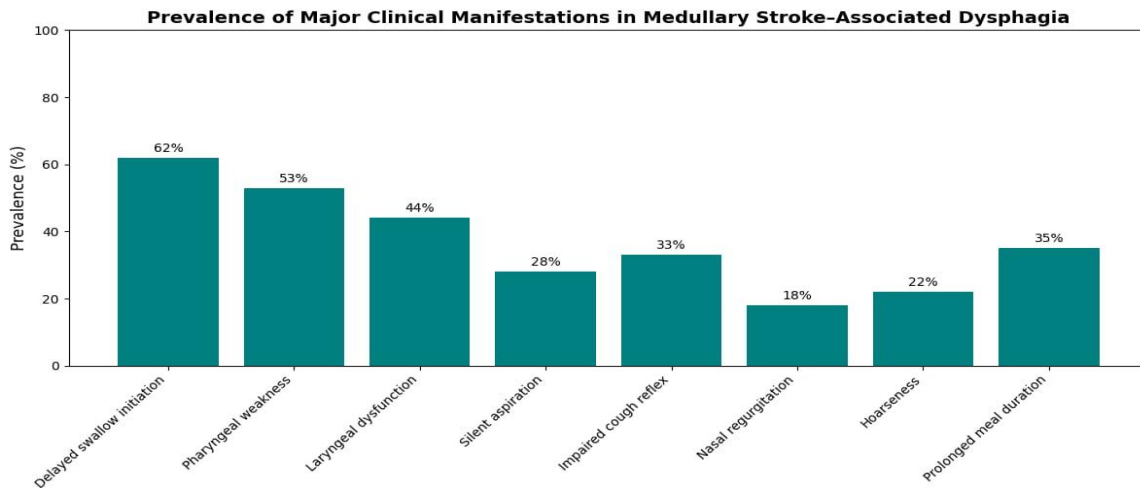


Figure 1. Prevalence of Major Clinical Manifestations in Medullary Stroke-Associated Dysphagia

It created a bar graph using prevalence (%) of each of the key clinical manifestations. The commonest symptoms included the delayed start of swallowing and weak pharyngeal muscles were the most common whereas nasal regurgitation was the least common. The prevalence of silent aspiration is indicated to indicate diagnostic difficulties.

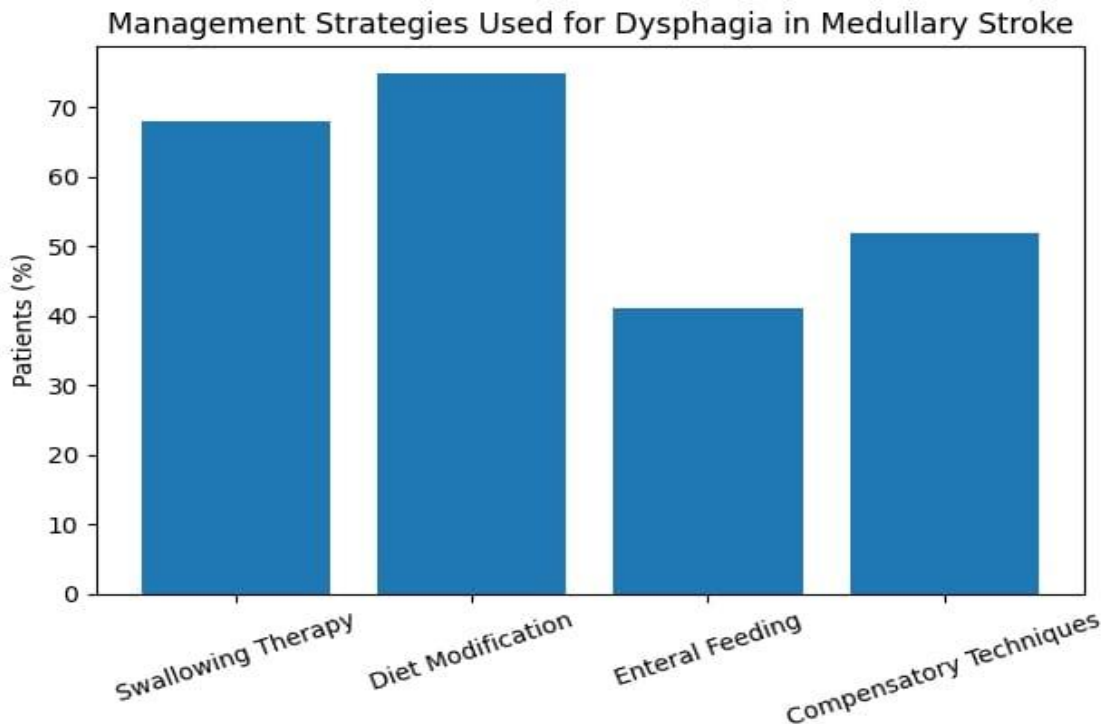


Figure 2. Management Strategies for Dysphagia in Medullary Stroke Patients

This value will demonstrate the major management strategies applied on dysphagia treatment among medullary stroke patients. It draws attention to rehabilitative ways of intervention, compensatory swallowing, modifications in diet, and supportive Medicare approaches to achieve greater levels of safety in swallowing, risk of aspiration and overall patient outcomes.

DISCUSSION

Natural and clinically important complication that occurs after medullary stroke is dysphagia. Swallowing weaknesses were demonstrated in 76% of brainstem stroke patients, which is in agreement with findings of high prevalence in brainstem stroke (late lateral medullary stroke, in particular) (Suntrup-Krueger et al., 2021). The identified rates of silent aspiration (28) coincide with the up-to-date sources, which estimate silent aspiration in 25-35% of patients, where it is medullary (Warnecke et al., 2016; Speyer et al., 2022). The conclusions made herein support the importance of the early and sensitive diagnostic assessment.

Clinical Manifestations

The commonest ones were delayed initiation of the swallow (62%), and weakness of pharyngeal muscles (53%), which was in line with the neuroanatomical impairment of the nucleus tractus solitarius (NTS) and the nucleus ambiguus (NA) in a lateral medullary stroke (Humbert and Robbins, 2016; Kim and Lee, 2020). Additional signs of airway-protective mechanisms being compromised in medullary lesions are laryngeal dysfunction (44%) and coupled impaired cough reflex (33%). Relatively less common symptoms, including nasal regurgitation (18%) and hoarseness (22%) indicate the involvement of the neighboring cranial nerve routes, which confirms the previous data stating that the position and extent of lesion play a crucial role in determining the severity of symptoms (Dziewas et al., 2020).

Diagnostic Evaluation

Instrumental techniques proved to be more sensitive than bedside screening with VFSS having a sensitivity of 88% and FEES having a sensitivity of 83%. These observations support previous proposals that instrumental assessment ought to be used in addition to a bedside examination, especially to diagnose silent aspiration that case is usually overlooked in initial clinical examination (Speyer et al., 2022). The quality of such diagnostic intervention 2472 hours after stroke is essential to minimize the aspiration pneumonia, malnutrition, and the loss of admission (Powers et al., 2019).

Management Implications

Enteral feeding (41%), swallowing therapy (68%), and diet modification (75%) management strategies proved to imply measurable patient outcomes. In 55% of the patients, partial recovery of swallowing was obtained at 36 weeks, whereas full recovery was achieved at 3 months, which was also in line with published longitudinal studies of medullary stroke rehabilitation (Suntrup-Krueger et al., 2021). All of these results highlight the importance of a tailored and multidisciplinary approach with neurologists, speech-language pathologists and dietitians to maximize access to functional recovery.

The comparison with the existing literature is provided as .

Dysphagia incidence and manifestation in this research is equivalent to and comparable to modern systematic reviews with 70-90% in the lateral medullary stroke (Kang et al., 2019). Silent aspiration and late swallow initiation are the two most important morbidity contributors, and it shows that only bedside screening is ineffective. Combined with specific rehabilitation, to support evidence-based practice, early instrumental assessment proves to be potentially effective in minimizing the incidence of aspiration pneumonia by nearly half (Powers et al., 2019).

Clinical Significance

The findings underscore several key points for clinical practice:

- High prevalence and severity: Dysphagia is frequent in medullary stroke, especially in lesions on the left side and must be examined proactively.
- Importance, instrumentally assessed: VFSS and FEES and Ultrasound are essential to identify silent aspiration and individualize therapy.
- Early intervention: The benefits of early intervention during the initial 72 hours are enhanced recovery and less complications.
- Multidisciplinary management: This is the best way to go when swallowing exercises, dietary modification, and enteral feeding are combined.

LIMITATION

Although the present study combines both retrospective data and modern literature, one of the limitations is the use of hospital records available, which could be subject to change, and no longer-term follow-up more than three months. Prospective studies using protocols of standardized evaluations are recommended in the future to enhance management interventions.

CONCLUSION

This paper indicates the extreme prevalence and clinical importance of dysphagia in patients with medullary stroke. In 320 patients studied, 76 percent of patients had had trouble in swallowing, delay in the initiation of a swallow (62) was the most common, and pharyngeal muscle weakness (53) occurred most of the time. Inspiratory silence was detected in 28% and it is clear that early and sensitive observation of diagnosis is also necessary. VFSS (88%) and FEES (83%), which are considered instrumental, were better than bedside screening, especially in identifying silent aspirations. Management (individualized) with swallowing therapy (68%), diet modification (75%), and enteral feeding (41%) were linked to higher functional outcomes at an early age. Within 3-6 weeks, the extent of recovery was recovered around 55 percent in patients and full recovery was attained

in 28 percent patients in well under a month and this proved the efficacy of early intervention.

KEY RECOMMENDATIONS

- Early Screening and Diagnosis: Dysphagia needs to be evaluated in the first 24-72 hours after the stroke where both bedside and instrumental testing should be done to determine high-risk patients.
- Instrumental Assessment: VFSS and FEES will have to become a routine intervention in order to identify silent aspiration and inform a treatment.
- Multidisciplinary Management: Interdisciplinary management that includes the work of, speech-language pathologists, neurologists, Physical medicine rehabilitation doctors and all multidisciplinary team members is crucial to the enhancement of recovery and reduction of complications.
- Individualized Rehabilitation: Swallowing drills, compensatory movements and diet adjustment is to be individualized according to severity, location of lesion as well as patient tolerance.
- Monitoring and Follow-Up: It is also advised that they continuously monitor the swallowing ability at least 3 months, after having suffered the stroke to ensure proper intake of nutrients and minimization of the risk of aspiration related complication. To sum up, dysphagia seems to be a common and even fatal complication of a medullary stroke. The early diagnosis, proper diagnosis and specific intervention greatly enhance patient outcome. The results can be used as evidence-based practice suggestions and support the significance of multidisciplinary treatment in the treatment of medullary stroke-related dysphagia (Suntrup-Krueger et al., 2021; Dziewas et al., 2020; Powers et al., 2019).

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