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Research Article

Functional Outcome Measurements in Acute Stroke Patients with Oropharyngeal Dysphagia after Swallowing Rehabilitation Therapy

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Abstract

Introduction: The study focuses on recovery patterns on swallowing in acute stroke patients after swallowing therapy.

Material and Method: Among 204 IPD acute stroke inpatients during the period of October 2015-January 2016, 189 patients with dysphagia and speech difficulties were divided into two groups of Infarct and Haemorrhage. The subjects received 30 minutes of swallowing therapy for 5 consecutive days and had 2 days off, until they reached from L-1to L-5 on Functional oral intake scale (FOIS - L1 to L7) rating scale. The outcomes measures were assessed on changes in FOIS and the duration of the therapy sessions until they reached L-5 on FOIS in both stroke group.

Results: Dysphagia was present in 92.6% of stroke patients with no significant age and gender differences. Females suffer from stroke at the younger age than males and 80% of patients were more than 50 years of their age. Prevalence of dysphagia ranged from 28% in Bleed and 72% in Infarct patients with no significant difference in their functional swallowing outcomes in Men and Women. At the end of the treatment, the average number of therapy sessions from L-1 to L-5 of FOIS per each subject were measured and there was significant difference between both the groups, which was 19.2 +/- 5.8 days in Bleed and 13.6 +/- 5.6 days in Infarct patients (p Value < 0.05).

Conclusion: Dedicated speech therapist with aggressive swallowing therapy during early phase of acute stroke inpatients, have better outcomes in oropharyngeal dysphagia.

Keywords: *Acute Stroke; Oropharyngeal Dysphagia; Swallowing Rehabilitation Therapy*

Introduction

Dysphagia in stroke

The World Health Organisation defines stroke as a clinical syndrome of rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than vascular origin [1].

Dysphagia is a difficulty in swallowing, which can be caused by many pathologies including stroke [4]. It results from lesions in central or peripheral nervous system as well as from diseases of muscle and disorders of neuromuscular junction. In the acute stage of illness, dysphagia is found in up to 50% of stroke patients, depending on the timing of the assessment, the diagnostic methods used. Dysphagia symptoms resolve in most patients with in a week to month and persist in only a small number of subjects beyond six months [2].

In patients with stroke, it is characterised by difficulty in safely moving food or liquids from the mouth to the stomach without aspiration (Logemann 1986). It may also involve difficulty in oral preparation for the swallow, such as chewing and tongue movement [2,3].

Normal swallow function

Swallowing has four sequential co-ordinated phases: The oral preparatory phase, the oral propulsive phase, the pharyngeal phase and esophageal phase [2,3,5]. Each phase as described below:

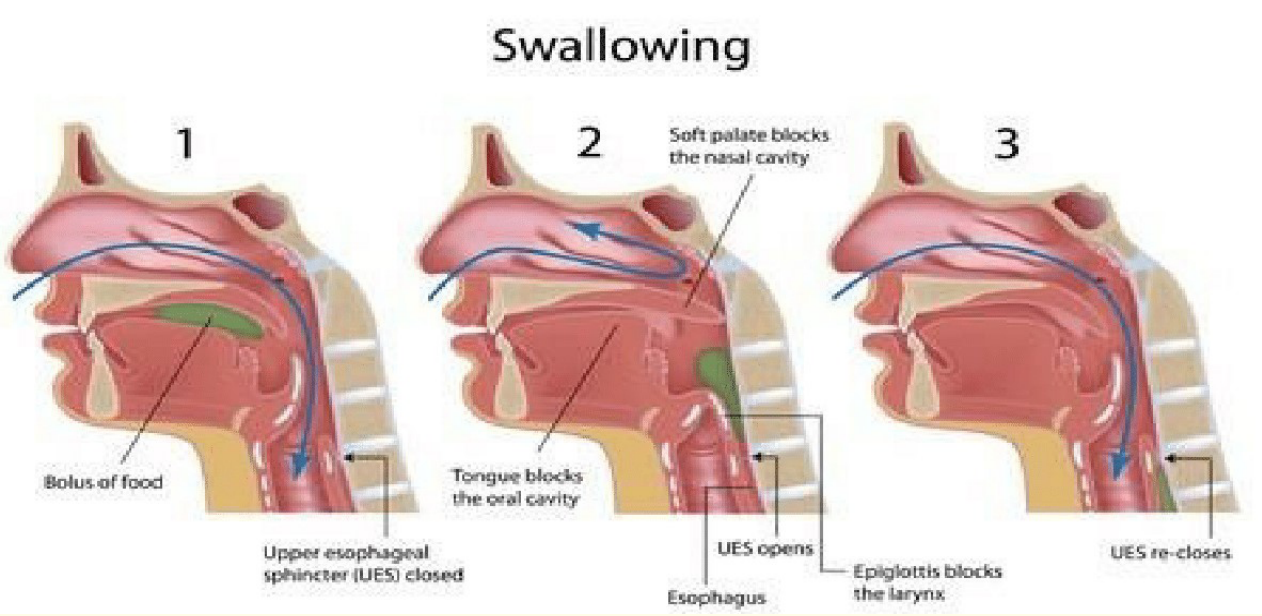

Figure 1

Oral preparatory phase: During this phase, food in the oral cavity is manipulated and masticated in preparation for swallowing. The back of the tongue controls the position of the food, preventing it from falling into pharynx.

Oral propulsive phase: During the oral propulsive, the tongue transfers the bolus of food to the pharynx, triggering the pharyngeal swallow.

Pharyngeal phase: During the pharyngeal phase, complex and co-ordinated movements of the tongue and pharyngeal structures propel the bolus from the pharynx into the esophagus. The closing of the vocal cords and the backward movement of the epiglottis prevents food/liquid from entering the trachea.

Esophageal phase: During the esophageal phase of swallowing, coordinated contractions of the esophageal muscle move the bolus through the esophagus towards the stomach [2-4].

Incidence and Prevalence

Dysphagia present in 65% of patients (Daniels., *et al* 1998). The Incidence rates are reported to be between 29 - 67% in acute stroke patients [15]. Up to 10% of individuals 50 years and above reported dysphagia. In elderly population, dysphagia has been found to be associated with increased mortality and morbidities such as malnutrition, dehydration and pulmonary compromise [9]. Evidence indicates that detecting and managing dysphagia in acute stroke survivors improves outcomes such as reduced risk of pneumonia, length of hospital stay and overall healthcare expenditures [9]. Patients with dysphagia are at risk of aspiration from food and saliva. Pulmonary

aspiration was found to be an important cause of serious illness and death in hospitalised patients. In stroke patients the prevalence of dysphagia ranged from 40% to 70%. Among which most are with silent aspiration [14,15,25].

Swallowing Rehabilitation Therapy

In patients who have dysphagia and failed in swallow evaluation the initial Swallow therapy will be started with the patient in order to overcome the swallowing dysfunction [6]. Swallow therapy in patients with neurogenic dysphagia takes two basic forms: Direct and Indirect. Direct swallow therapy emphasizes compensatory techniques to help and cope up with sensorimotor impairment of the oral cavity, pharynx, and/or larynx, resulting in swallowing dysfunction. Indirect swallow therapy, on the other hand, attempts to overcome sensorimotor impairment through stimulation techniques and exercises to enhance the swallowing reflex, alter muscle tone, and improve the function of voluntary or facial, lingual, and laryngeal muscles [2,4,6,7].

It is based on principle that, following neurologic injury, recovery of lost functions can be facilitated by specific stimulation and re-education of neural pathways governing those functions. This principle underlies many established neurologic Rehabilitation compensatory Strategies like Postural adjustments, and swallow Maneuvers like Supraglottic swallowing, the Mendelsohn maneuver, and Effortful swallowing have been reported as the standard treatment for stroke survivors with dysphagia [27,31,33]. The therapy for each patient followed a similar format. Individual variations within certain limits were allowed at the discretion of training clinician, but the format was maintained across all patients [23,26]. This format was based on set of swallowing instructions that focused on bolus control and airway protection. The therapeutic strategies were explained and administered by a speech Therapist.

Objectives

We aimed to evaluate the Incidence and Prevalence and their functional outcome recovery period in acute stroke patients with oropharyngeal dysphagia after swallowing Rehabilitation therapy.

Materials and Methods

Between October 2015 and Jan 2016, there were 204 patients with Acute stroke were Admitted in Medanta-The Medicity Hospital. Among which, we were enrolled 189 (92%) patients (137- Men's, and 52- women's) with speech and swallowing difficulties, who were admitted to a Neurology unit of Medanta Institute of Neurosciences Department in Medanta-the Medicity Hospital in Gurgaon and they have been divided into two Groups. Group-1 were with Bleed patients and Group-2 with Infarcts patients. All patients had stroke for the first time and visited Medanta as the primary Hospital. All of them affected with stroke at the Age of 50 years and above were reported in the study. The stroke were diagnosed by Neurologists according to clinical neurologic deficits relating to their brain damage and the findings on computed tomography or magnetic resonance imaging scans. Their swallowing disorders were impressed by the physician taking the history of choking or cough during swallowing or wet voice after conducting a 100-ml water test. Furthermore, a formal swallowing condition was assessed by Speech – language therapist.

In this all subjects were evaluated with the initial Bed side Clinical Swallow Evaluation and they are graded with their Functional oral intake scale (FOIS) from Level -1 to Level -7. Stroke patients typically began the protocol with 5 ml of thickened liquids as this material afforded the best airway protection. If patient has no signs of choking or cough, the therapist would change properties of food which followed gradually according to standard guidelines. In this groups, any patient with facial weakness of facial muscles was treated with facial exercise. If the patients failed in the swallow evaluation then they will be started up with the five consecutive days of swallow therapy with on and off for one or two days in a week period. Later intermittently swallow evaluation is done to upgrade the (FOIS) Levels and to check out the functional recovery period of the patient, and also to the durational period to reach the FOIS- Level -5 by the dysphagic stroke patient. In addition to this the Compensatory swallow strategies are used in order to overcome the swallowing difficulties in stroke patients.

Head posture changes			
Technique	**Performance**	**Intended outcomes**	**Reported benefit**
Head extension/chin up	Raise chin	• Propels bolus to back of mouth • Widens oropharynx	• Reduced aspiration • Better bolus transport
Head flexion/chin tuck	Tucking chin towards the chest	Improves airway protection.	Reduced aspiration
Head rotation/head turn	Turning head towards the weaker side	• Reduces residue after swallow. • Reduces aspiration.	• Less residue • Reduced aspiration

Table 1: *Representing the postural changes.*

Swallow Maneuver	Performance	Intended outcomes	Reported benefits
Supraglottic swallow	Hold breath, swallow, and then gentle cough	Reduce aspiration and increase movement of larynx	Reduces aspiration
Super supraglottic swallow	Hold breath, bear down, swallow and then gentle cough		
Effortful swallow also called as 'hard'/'forceful swallow'.	Swallow 'harder'	• Increase lingual force of bolus • Less aspiration and pharyngeal residue.	Increased pharyngeal pressure and less residue.
Mendelsohn maneuver	Squeeze at apex	Improve swallow co-ordination	Reduced residue and aspiration.

Table 2: *Representing the swallow Maneuvers.*

Inclusion and Exclusion Criteria

The inclusive criteria in the present study were considered as recent acute stroke patients who are visiting Medanta Hospital for primary treatment and has swallowing difficulty on functional oral intake scale (FOIS) and graded with the Level -1 in initial clinical swallow evaluation. The patients GCS should be E4 M6 at the time of initial swallow evaluation. All patient should have better cognition.

The Exclusive criteria were as follows:

1. Patient GCS should not be less than E4 M6.
2. Impaired communication ability due to cognitive deficit
3. Other, systemic neurologic disorders leading to swallowing difficulties.
4. Patients with oropharyngeal tumour or extensive surgeries and radiotherapy of head and neck were not involved.
5. Pneumonia or acute medical conditions.

Procedure

1. All patients with swallowing and speech difficulties were selected from all stroke patients and they were categorized into two groups i.e. Group-1 and Group-2 from group of acute stroke patients.

2. Later all patients were underwent with initial clinical bed side swallow evaluation with their function oral intake scale grading. All patients who are graded with Level-1 on the FOIS were immediately started with the swallow therapy for continuous five days with intermittent on and off in a week period.

3. The active and passive exercise were used in swallow therapy in patients who have oropharyngeal deficits and facial weakness with 30 minutes of duration period.

4. As the patient start with the oral intake the FOIS levels will upgraded regularly and the compensatory strategies and swallow maneuver were also provided in order to overcome the swallow difficulty. The specific and compensatory techniques and swallowing maneuvers was based on the findings of clinical bed side swallow evaluation. This group patients was treated 3 times per week and with required number of sessions.

5. Later we check the Duration of swallow therapy and gradual functional recovery of swallowing based on the FOIS measurements until the patient reaches to level-5 in this study.

6. The patient with speech difficulties were also assessed and Diagnosed with the type of speech deficits and speech therapy session was provided and Counselling sessions was done with Care takers and Home Based Management Programme [HBM] was given for the same.

Outcome measures

The outcome measures were assessed as changes in functional oral intake, and complications related to treatment and the swallow therapies. The functional swallowing ability of each individual was estimated using the Functional oral intake scale (FOIS) a 7 – pointing rated scale reflecting the patients report of food/liquids safely ingested by mouth on a consistent basis. The scale has strong reliability and validity specific to stroke populations. Patients recordings of the daily diet level and method of intake (oral, nonoral, use of compensations) were determined and compared to FOIS scale results. Each patients report recorded the typical diet level along with any food modifications and/behavioural compensations used during eating. Each patients diet level was documented at the onset of the therapy and again at the conclusion of the therapy and compared the scale. The duration period was calculated for each patients.

Statistical Analysis

The analysis were include profiling of patients on different Demographic, FOIS score type of stroke variables were evaluated between the two group patients using the independent Student t-test (age, post stroke duration) and Chi square test were used to (gender, type of stroke). The total number of pre-therapy FOIS scores, and the durational period of the therapy sessions in particular stroke type and post- therapy FOIS scores and mean changes in FOIS scores in RST between both the groups along with the gender differentiation were evaluated with t- test. A statistical significant difference was considered at a p-value test less than.

Results

One eighty nine patients with speech and swallowing problems were selected from overall Acute stroke patients 204 in the present study (Total-N = (204/189(92%)). Among which one-twenty-four patients with only swallowing difficulties were randomized for active swallowing rehabilitation therapy (RST, N = 124 (65.6%)) and length of hospital stay is (24.6 +/- 12.5) among which six patients were received rehabilitation swallow therapy after discharge of hospital stay (RST –D/C, N = 6 (4.83%)) and length of hospital stay is (20.3 +/ -5.7). All of these (124 (100%)) patients were received Active and Passive Exercises. Among which there are eighty- eight patients who has received only Active Exercises (AE, N = 88 (71%)and thirty-six patients were received Active and Passive exercises (AE & PE, N = 36 (29%)) and there are One- hundred and six patients who were received compensatory swallow maneuver (CSM, N = 106 (85%) and eighteen patients who were not received compensatory swallow maneuver (N/CSM, N = 18 (14.5%) and there are sixty-five patients

randomized for speech evaluation, speech therapy was provided and counselling session was done with the attendant and the Home Based Management programme (HBM) were provided for each (SPT, N = 65 (34.3%) and there are thirty-nine patients who were received both swallowing rehabilitation therapy and speech therapy (Combined RST and SPT, N = 39 (20.6%)) and length of hospital stay is (21.7 +/- 9.3).

Group-1: There are over all fifty-three patients with Bleed (B, N = 53) in this group -1. Among which there are Thirty-six patients with left hemisphere Bleed (LT-B, N = 36 (9.0%)) and seventeen patient with right hemisphere Bleed (RT-B, N = 17(19.0)). In Left hemisphere bleed there are 22 (61%) with BG Bleed, 2 (5.5%) with ventricular bleed, 1 (2.7%) with transverse temporo-parital bleed, 3 (8.3%) with frontal and fronto-parital and temporal bleed, and there are 6 (16.6%) with thalamic bleed, 2 (5.5%) with cerebellar bleed. In Right hemisphere bleed there are 9 (53%) patients with BG bleed and 2 (11.7%) with thalamic bleed, 2 (11.7%) IVH, 2 (11.7%) Brainstem bleed and 2 (11.7%) frontal bleed.

Group-2: There are over all one-thirty-six patients with Infarcts (I, N = 136) in this Group-2. Among which there are 125 (66.1%) patients with left hemisphere Infarcts (LT-I, N = 125) and patient with right hemisphere Infarcts are 11 (5.8%) (RT-I, N = 11). In Left hemisphere Infarct there are 114 (91.2%) patients with LT- MCA, 2 (1.6%) with PICA and multiple cerebral infarcts, 4 (3.2%) patients with frontal and fronto-temporo-parital infarcts, and 2 (1.6%) with medullary infarct, 2 (1.6%) with temporo-parital infarct. In Right hemisphere Infarcts there are 10 (91%) with RT-MCA, 2 (18.1%) with PICA and 1 (9.0%) with medullary infarct.

The highest rate of dysphagia severity was noted in all 124 (100%) patients with initial swallow assessment with FOIS by giving a grading with Level-1. After swallowing rehabilitation therapy there are (95.3%) are improved with their swallowing with total oral intake and they were all graded with Level-5 based on FOIS at the time of discharge (Table 3). There are only 6 (4.9%)patients who are graded with Level-3 why consistent oral intake based on FOIS at the time of discharge (Table 3). Later these 6 patients also improved their swallowing with no significant difference.

Levels	Functional Oral Intake Scale
Level-1	Nothing by mouth
Level-2	Tube dependent with minimal attempts of food/liquids
Level-3	Tube dependent with consistent oral intake of food/liquids
Level-4	Total oral diet with single consistency
Level-5	Total oral diet with multiple consistencies but requiring special preparation/compensations.
Level-6	Total oral diet with multiple consistencies without special preparation, but with specific food limitations.
Level-7	Normal, No Restrictions.

Table 3: *Functional Oral Intake Scale (FOIS).*

There are 189 (92.6%) of patients with dysphagia were randomly selected among 204 Acute stroke patients. The prevalence of dysphagia in stroke patients was differentiated between two groups like (28%) in Bleed patients (Group-1) and (72%) in Infarct patients (Group-2).

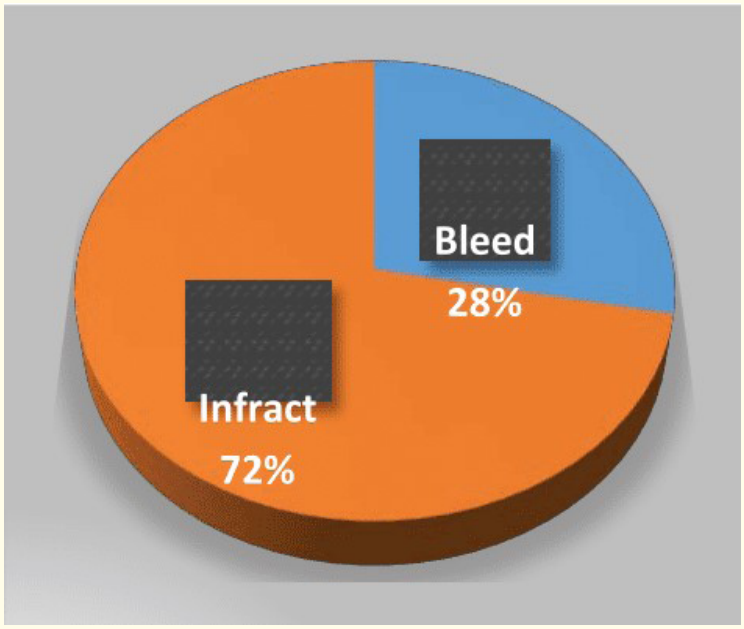

Figure 2: *Representing incidence and prevalence.*

Among this there are fifty- two female patients (F, N = 52) with age range of (58.9 +/- 4.5) and one- thirty- seven (M,N = 137) Males with age range of (62.2 +/- 6.5) were randomized in the present study. In Group-1 there are (19.7 +/- 5.8) Men's and (18.2 +/- 5.8) Women's. In Group-2 there are (14.1 +/- 6.0) Men's and (11.7 +/- 11.7 +/- 3.8) Women's. Among these most of the patients falls above the age range of 50 years. This study shows that Females are effected with stroke at younger age than Males (M:F = 62.2 +/- 6.5 : 58.9 +/- 4.5) with a statistical significant p- value (0.007). There are (90) men's (15.9 +/- 6.4) and (34) women's (14.8 +/- 5.8) with p-value (0.382) in the study who has taken intensive swallow therapy.

In this there are (29 (32%)) men's and (16 (47%)) women's in Group-1 and there are (61 (67.7%)) men's and (18 (52.9%)) women's in Group-2. In detail the sub-divisions of type of stroke in men and women was given in the following (Table 4).

Diagnosis	Types					
	Group-1-B (N = 53)		Group-2-I (N = 136)		Total (N = 189)	
	M 35 (%)	F 18 (%)	M 102 (%)	F 34 (%)	M 137 (%)	F N=52)
RT-Hemisphere	12 (34.3)	4 (22.2)	0 (0.0)	0 (0.0)	12 (8.8)	4 (7.7)
LT-Hemisphere	23 (65.7)	13 (72.2)	0 (0.0)	0 (0.0)	23 (16.8)	13 (25.0)
RT-Hemisphere	0 (0.0)	0 (0.0)	10 (9.8)	2 (5.9)	10 (7.3)	2 (3.8)
LT-Hemisphere	0 (0.0)	1 (5.6)	92 (90.2)	32 (94.1)	92 (67.2)	33 (63.5)

Table 4: *Representing the percentage of type of stroke in Men Vs. women.*

The functional outcomes of swallowing rehabilitation therapy among Men Vs. Women is (15.9 +/- 6.4 Vs. 14.8 +/- 5.8) with no significant difference in p-value of (0.382). The Length of hospital stay between Men Vs. women was ranged as (25.6 +/- 13.4 vs. 21.9 +/- 9.7) and there is no statistical significant difference with p-value of (0.143). In Group-1 the duration of swallow therapy in (29) Men's is (19.7 +/- 5.8) and in (16) females is (18.2 +/- 5.8) with no significant p-value (0.441). In Group-2 the duration of swallow therapy in (61) men's (14.1 +/- 6.0) and in (18) females (11.7 +/- 3.8) with no significant difference in p-value (0.113). There was no significant difference noted in both men and women.

Functional Recovery in swallowing

Overall, 118 (95.2%) of patients improved by five levels of their (FOIS) Functional oral intake by at least (24.8 +/- 12.8) days and 6 (4.8%) improved three levels of FOIS with in (20.3 +/- 5.7) days and later improved with level five with (20.3 +/- 5.7) days after discharge in prior to swallow therapy. The average changes in FOIS scores were measured and the duration of swallowing rehabilitation therapy in patients with Group-1 is (19.2 +/- 5.8) and in Group-2 is (13.6 +/- 5.6) with p value (< 0.006). All of them have improved equally but the durational period of swallowing rehabilitation therapy and swallowing recovery was fast in patients with Group-1 than in patients with Group-2. No Patient in either group improved with six levels or more.

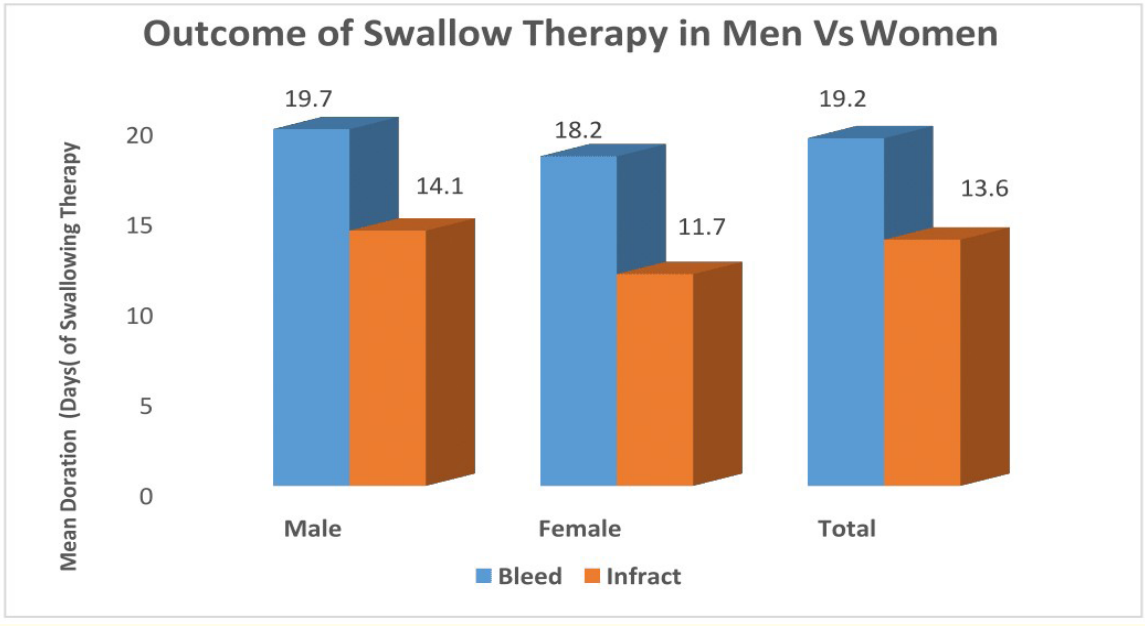

Figure 3: *Representing the overall recovery pattern in male vs. female with respect to type of stroke.*

Discussion

Dysphagia is a common complication following in stroke [4]. In this study we investigated the effects of swallowing Rehabilitation therapy in acute stroke with or pharyngeal dysphagia by FOIS with 7- point rating scale. The results in this study showed that Rehabilitation swallow therapy has significant improvement on clinical FOIS scores. Gordon., *et al*. reported that 37% of their subjects had dysphagia for less than eight days followed a stroke while about 86% of patients could swallow normally within 14 days [10]. Within 6 months after stroke, 79% - 92% of these patients had returned to their pre-stroke diet [10,16,18]. This study also supports the Gordon., *et al*.

study. In the present study the Compensatory strategies and swallow managers were used for swallowing training, the specific strategies chosen were depend on the results and patient comfort. The presented data showed a high percentage of patients with severe dysphagia (FOIS level-1). After therapy, 95.3% of these patients progressed to functional swallowing (FOIS level -5) and other 4.8% patient improved after hospital discharge.

Over all, all patients have improved their swallowing with no significant difference. The good progress of the presented patients was probably because they received intensive swallowing rehabilitation training (30 min per session) with a long number of sessions until the FOIS score reaches level-5. Expert consensus support the use of manoeuvres such as chin tuck when swallowing, head turn or Mendelsohn manoeuvre. In the present study there is a significant statistical difference before swallow therapy and after therapy of FOIS scores and the patient was got discharged on soft diet along with thin liquids among which few are suggested to continue the swallow maneuver and few are not. Patient who has received both active and passive exercises along with compensatory strategies showed good improvement than who received only active exercises. However, this exercises can't improve their compensation in the face of stable oropharyngeal dysfunction. The previous studies which have been used as a supporting studies have not showed any specific evidence of improvement in particular stroke type [4,6,7,10,12]. But the current study has the evidence to help predict which patient with neurogenic dysphagia are more or less likely to respond favourably to swallowing therapy.

In summary, Rehabilitation swallow therapy have therapeutic effects on improving the swallowing function based on the clinical FOIS-Level-7 in acute stroke patients with dysphagia. There is no significant difference in both groups, but the duration of recovery pattern was long in patients with Group-1 than in patients with Group-2. In present study all patients were considered only till FOIS- Leve-5. Next researcher can focus till Level- 6/7 of FOIS and can do detail investigation in stroke type with their functional oral outcomes along with the use of neuromuscular electrical stimulation.

Conclusions

Dedicated speech therapist with aggressive swallowing therapy during early phase of acute stroke inpatients, have better outcomes in oropharyngeal dysphagia. However a large study is require in relation with size and site of lesion.

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