

Long-term outcome after stroke: does dysphagia matter?

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Abstract

Background: swallowing problems (dysphagia) are common following acute stroke and are independent predictors of short-term outcome. It is uncertain as to whether these swallowing problems are associated with outcome in the longer-term.

Aim: insert to determine whether dysphagia present in the first week of acute stroke is associated with long-term outcome.

Methods: a population-based long-term follow-up of people with first in a life-time stroke. Dysphagia was assessed within 1 week of stroke and patients were followed up at 3 months and yearly for 5 years by face-to-face interview. Outcome was defined by survival and place of residence, using multinomial logistic regression. Barthel Scores were divided into the two groups 15–20 and 0–14, and modelled using multiple logistic regression.

Results: there were 567 patients with dysphagia (mean age 74.3 years) and 621 with a safe swallow (mean age 69.6 years). Following multinomial logistic regression, residence in a nursing home was more likely to occur in those who failed the swallow test during the first week of their stroke; however, this only reached statistical significance at 3 months (relative risk ratio (RRR) = 1.73; 95% confidence interval (CI) 1.02 to 2.95), and years 4 (RRR 3.35, 1.37–8.19) and 5 (RRR 3.06, 1.06–8.83). There was also a significant association with increased mortality only during the first three months (RRR 2.03, 1.12 to 3.67).

Conclusion: this study confirms that the presence of dysphagia during the acute phase of stroke is associated with poor outcome during the subsequent year, particularly at 3 months, and is associated with increased institutionalisation rate in the long term.

Keywords: stroke, community, dysphagia, outcome, elderly

Introduction

Dysphagia occurs in 30–50% of people following stroke [1, 2]. Minor abnormalities in swallowing may occur in nearly all patients with acute stroke [2]. Although, in many people the ability to eat and drink is regained quickly, problems may persist in between 11 and 50% at 6 months [1, 2].

Studies have shown that the presence of dysphagia, at the time of admission to hospital, is independently associated with poor outcome, including poor functional ability, institutionalisation and increased mortality [1, 3, 4]. Those studies that have examined the presence of dysphagia have found that the association between dysphagia on admission and poor outcome persists for 6 months following stroke. It may be the strongest predictor of outcome at this

time, and is probably independent of any aspiration that may occur [5]. More recent videofluoroscopy-based (VF-based) studies have noted that the absence of a pharyngeal swallow [6] but not aspiration [7] are associated with increased mortality at 72 and 30 months respectively, though most deaths occurred in the first 3 months (6, M Power personal communication).

All the previous studies have used either a hospital-based cohort or selected populations referred for swallowing assessment or VF [1–3, 6, 7]; none have examined the prevalence of dysphagia and its outcome in a community population-based sample.

Stroke severity is a marker of long-term outcome [8–11], what particular aspects are the reliable markers is uncertain.

Long-term studies are required to provide information enabling the stroke team to plan future care and support.

This study has attempted to answer the question, 'Is dysphagia present in the first week of acute stroke associated with long-term outcome?', using prospectively collected information from a population-based community stroke register.

Methods

Patients from South London with first in a life-time stroke were recruited to the South London Stroke Register (SLSR), which has been described elsewhere [12]. First in a life-time stroke cases were identified using multiple sources of notification (contacting local hospitals, telephoning general practitioners, and notification slips returned by district nurses and general practitioners). Patients or relatives, if more appropriate, were then approached for consent for inclusion in the study. The Guy's and St Thomas' Research Ethics Committee granted approval. Patients are assessed initially, at 3 months and annually thereafter.

For this study, patients recruited between the years 1995–1998 were identified and followed up for 5 years. Patients were followed up by face-to-face interview, one at a time, arranged by telephone or cold calling following a letter where contact could not be made by telephone. This efficient method of follow-up enables information to be collected on most patients who remain alive and living in the SLSR area.

The ability to swallow was assessed by using a standard swallow test undertaken within the first week of stroke. The test was conducted by either a dysphagia trained speech and language therapist, or a nurse who had undergone training in swallowing assessment. A standard two stage bedside swallowing assessment (able to swallow a 5 ml spoonful of water (stage 1) and then if successful using 60 ml of water, to be swallowed within 2 min (stage 2)) was undertaken [1]. Failure at either stage was recorded as a failed swallow test [1, 13, 14]. A swallow was adjudged unsafe if the voice was wet after the swallow, there was lack of laryngeal elevation, coughing and choking during swallowing or during the first 2 min after the assessment. Failure to complete the swallow assessment resulted in the patient being assessed as unsafe for water, further assessments were conducted using different consistencies as appropriate, to substantiate the diagnosis of dysphagia.

Demographic data (age, sex, ethnicity (white, black), living conditions and employment status at the time of the stroke) were recorded. Pre-stroke risk factors considered were current smoking status and high alcohol intake (≥ 14 units per week for women, ≥ 21 units for men), previous history of migraine, epilepsy, diabetes, ischaemic heart disease, atrial fibrillation, transient ischaemic attacks (TIA), hypertension, and prior prescriptions of aspirin, antihypertensives, antidepressants and antipsychotics. Case severity variables included the Glasgow Coma Score (GCS) [15] and motor deficit in terms of limb weakness using the Medical Research Council (MRC) scale [16], were used in multivariable analyses.

Apart from the presence or absence of dysphagia, those variables that have previously been shown to affect outcome (urinary incontinence during the first 2 weeks, neglect, dysarthria and dysphasia) [17] were recorded. Dyspraxia was rated by the patient's ability to dress at an assessment made around 1 week after the stroke.

Strokes were classified as per the Oxford Community Stroke Project classification; stroke subtype was used to categorise according to the following: posterior cerebral infarction (POCI), total anterior cerebral infarction (TACI), partial anterior cerebral infarction (PACI), lacunar infarction (LACI), primary intracerebral haemorrhage (PICH), subarachnoid haemorrhage (SAH) and unclassified [18].

Outcome was assessed at 3 months following the stroke and then yearly. Dependency following stroke was assessed and categorised into the following: living at home alone (independent), living at home but supported by family or community services (independent but receiving help), unable to live in own home (dependent) or dead. For those classed as independent but receiving help, assistance by friends and family was taken as help with everyday activities, cleaning the house, meal preparation and bathing at least once a week. The community services considered were for the week prior to assessment. They comprised uptake of meals on wheels, having a home help, attendance at a day centre or day hospital and being visited by a district nurse. Those classified as dependent were living in a nursing home, residential home or hospital and did not therefore require community services. In addition, the Barthel Score [19] at each follow-up was taken as an outcome, divided into high (15–20) or low (0–14).

Univariable analyses examined differences between those who passed and those who failed the swallow test in terms of sociodemographic factors, risk factors before stroke, case severity and stroke subtype. Age was compared using the unpaired *t*-test and the chi-squared test was used for categorical variables.

Following univariable examination of factors that could potentially influence the swallow test, and exploratory analyses involving smaller numbers of variables [20] the following variables were entered into multivariable regression models together: age (as a continuous variable); gender; prior-to-stroke records of TIA (yes or no); arm weakness, leg weakness (both scored from 0—no weakness in either arm to 4—paralysis in both limbs); GCS (< 11 , ≥ 11); ability to dress at 7 days (yes or no); and visual field defect, visual neglect, dysphasia (present or absent).

Multinomial logistic regression [21] was used to model the effect of dysphagia on the patient's dependency (categories as defined above). Analyses were performed on the level of dependency for the time period being studied using Stata Version 9.0 [22]. The grouped Barthel Scores were modelled using multiple logistic regression.

Survival after the initial stroke was examined using unadjusted Kaplan–Meier curves, with comparison between patients who passed the swallow test and those who failed made with the log-rank test [23].

Results

At the end of 2003, the SLSR database held records of 1288 patients who had been recruited up to 8 years earlier (initial stroke between 1995 and 1998). Of these 1188 (92%) had their swallow assessed, and 1080 (83.9%) were admitted. Fifty-eight patients either died immediately at the time of their stroke, or on admission. These are not included in the data. There were 567 patients who failed the swallow test, and were consequently deemed at risk of aspiration, and 621 patients who were assessed as having a safe swallow, sufficient with a significance level of 0.05 to detect a true difference in proportions of 10% with a power of 92.4%.

Patients who failed the swallow test are compared to those who passed the test in Table 1. Those assessed as having dysphagia were older, with a mean age of 74.3 years (SD = 13.0); vs. 69.6 years (SD = 14.0) ($P < 0.001$) and more likely to be female (320 (56.4%) vs. 297 (47.8%), $P = 0.003$). There was no difference in the presence of risk factors except smoking and records of atrial fibrillation were more common in the dysphagia group.

On univariate analysis, of those that had a CT scan, there was a clear difference in the pathology ($P < 0.001$). Those that were assessed as being safe were more likely to have had an infarct [361 (63.7%) vs. 502 (80.8%)], and less

likely to have had an intracranial haemorrhage (58 (9.3%) vs. 89 (15.7%)). Dysphagia was more likely to be present in those patients who suffered a TACI [152 (26.8%) vs. 31 (5.0%)].

Overall, those who were assessed as having an unsafe swallow had a more severe stroke; as demonstrated by a reduced conscious level (GCS < 11), and the presence of cortical signs (visual field defect, visual neglect and dysarthria), all with $P < 0.001$.

Following multinomial logistic regression (Table 2), residence in a nursing home was more likely with a failed swallow test; however, this only reached statistical significance at 3 months (RRR = 1.73; 95% CI 1.02 to 2.95), and years 4 (RRR 3.35, 1.37–8.19) and 5 (RRR 3.06, 1.06–8.83). However, dependency as assessed by the Barthel Score was not associated with dysphagia after stroke apart from year 4 (RRR 2.44, 1.08 to 5.51) (Table 2).

The presence of dysphagia during the acute phase of stroke was associated with increased mortality as shown on the Kaplan–Meier plot (log-rank test $P < 0.001$). This was particularly the case during the first 3 months (RRR 2.03, 1.12 to 3.67). Although this trend continued over 5 years, the association was weaker with each successive year (Table 2, Figure 1).

Table 1. Patient characteristics for the swallow test outcome groups

	Failed (<i>n</i> = 567)	Passed (<i>n</i> = 621)	<i>P</i> -value
Mean age (SD)	74.3 (13.0)	69.6 (14.0)	<0.001
Male sex	247 (43.6)	324 (52.2)	0.003
Black ethnicity	73 (12.9)	119 (19.3)	0.012
Barthel Score <15— prior-to-stroke	59 (10.6%)	27 (4.4%)	<0.001
Current smoker	379 (71.8)	372 (62.8)	<0.001
Records of:			
IHD	144 (26.1)	137 (23.0)	0.222
Hypertension atrial	369 (67.7)	424 (71.5)	0.164
Fibrillation	143 (26.2)	97 (16.4)	<0.001
Diabetes	86 (15.6)	108 (18.1)	0.257
TIA	83 (15.6)	107 (18.0)	0.281
Glasgow Coma Score <11	245 (43.8)	16 (2.6%)	<0.001
Visual field defect	232 (58.9)	103 (17.6)	<0.001
Visual neglect	166 (44.4)	80 (13.7)	<0.001
Dysarthria	274 (80.4)	217 (38.4)	<0.001
Arm weakness: median (inter quantile range)	1 (0, 1)	1 (1, 2)	<0.001
Leg weakness: median (inter quantile range)	1 (0, 1)	1 (1, 2)	<0.001
Stroke subtype ^a :	361 (63.7)	502 (80.8)	<0.001
Infarct	73 (12.9)	214 (34.5)	
LACI	152 (26.8)	31 (5.0)	
TACI	89 (15.7)	163 (26.3)	
PACI	47 (8.3)	94 (15.1)	<0.001
POCI	89 (15.7)	58 (9.3)	
PICH	29 (5.1)	29 (4.7)	
SAH	88 (15.5)	32 (5.2)	
Unclassified— no CT scan	399 (93.0)	302 (52.7)	<0.001
Need help dressing			

NB values in parentheses are percentages based on cases with known values.

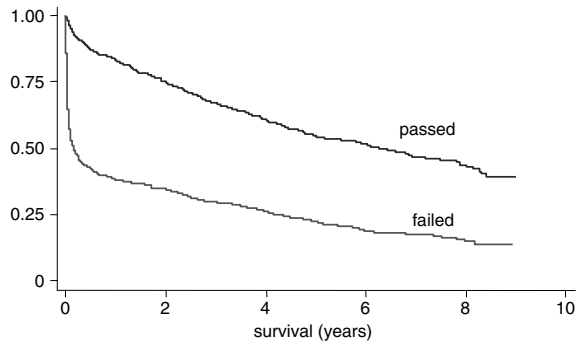
^aAbbreviations explained in the Methods. The chosen variables have all been found, in a wide range of published studies to be strong predictors of outcome.

Table 2. The association between failed swallow test and (a) residence in a nursing home, (b) death, (c) Barthel Score ≥ 15 , versus independent living (odds ratio, 95% CI)^a

	3 months	1 year	2 years	3 years	4 years	5 years
Nursing home	1.73 ^b (1.02–2.95)	1.48 (0.79–2.77)	2.08 (0.66–6.57)	1.78 (0.79–4.00)	3.35 ^b (1.37–8.19)	3.06 ^b (1.06–8.83)
Death	2.03 ^b (1.12–3.67)	1.60 (0.98–2.63)	1.14 (0.61–2.13)	1.17 (0.71–1.91)	1.12 (0.66–1.89)	1.07 (0.62–1.87)
Barthel Score ≥ 15	0.80 (0.47–1.38)	1.22 (0.70–2.13)	0.65 (0.23–1.79)	1.01 (0.51–2.00)	2.44 ^b (1.08–5.51)	0.82 (0.30–2.19)

^aAdjusted for age, gender, TIA records, Glasgow Coma Score <11, arm weakness, leg weakness, visual field defect, visual neglect, dysphasia, dysarthria and ability to dress at 5–10 days.

^bP<0.05.



At risk:

Passed	621	518	466	416	375	338	229	146	63
Failed	567	216	197	169	149	128	84	51	17

Figure 1. Kaplan–Meier survival estimates by swallow test result.

Discussion

This is the first study to investigate the association of dysphagia present at the time of stroke and outcome in a community-based population, and is consequently likely to provide a representation of stroke as a whole. The prevalence of dysphagia (44%) in this population is similar to that demonstrated in predominantly hospital-based studies [1, 2, 24]. This finding is reassuring but also not surprising as the majority of stroke patients are admitted to hospital. This study, in common with many other studies, has demonstrated increased mortality and dependency (nursing home admission), in those patients in whom dysphagia was present during the acute phase of stroke [1, 2].

Many studies have found that dysphagia during the acute phase of stroke is common and that there is an association between dysphagia and outcome at 6 months, which is independent of other markers of stroke severity. A few studies have commented on its effect up to 1 year following the stroke or longer [6–8]. Two recent VF-based studies, have investigated the effect on survival of aspiration or an absent pharyngeal swallow. Aspiration was not noted to be associated with survival [7] but an absent pharyngeal swallow was, particularly, in the first 3 months [6]. At 1 year this effect was found only for mortality and not dependency.

The poor early survival of those with dysphagia, may be due to stroke severity [6] as demonstrated here by the increased numbers of total anterior strokes present in those with dysphagia. In the present study, those patients who

had dysphagia during the acute phase of their swallow were older (74.3 years vs 69.6 years) and tended to have more severe strokes, as documented by the presence of visual field defects, visual neglect, reduced conscious level and the presence of atrial fibrillation (Table 1).

The presence of dysphagia, in this community study, at the time of stroke confirms the results of hospital-based studies, in being an independent predictor of admission to nursing homes, following hospital discharge within the first 3 months and with a trend over the first year after stroke [1, 4, 25]. The association over the subsequent years was weaker, and not statistically significant except at years 4 and 5, after the stroke. Combining death and nursing home residence as one variable, the association persists at 3 months (1.84 (1.17, 2.91) and 1 year (1.57 (1.01, 2.44), but the association with death or residence in a nursing home at years 4 and 5 is not found. This indicates that if poor outcome is taken in a broad sense the association with the presence of dysphagia as assessed in the first week of stroke, exists only throughout the first year. The Perth Community Stroke Study [26], although with smaller numbers, also found that age, moderate or severe hemiparesis and recurrent stroke were significant predictors of death, disability or institutionalisation at 5 years, which would support the proposition that stroke severity may be the major predictive factor rather than dysphagia.

We did not find any association with disability as assessed by the Barthel Score, until year 4 (Table 2). Dividing the Barthel measure into scores of 20 and 0–19 instead of 15–20 and 0–14 gave a similar result. In a study, with as many comparisons as this one, this particular result is likely to be a chance finding.

This study confirms the relationship between dysphagia and long-term outcome. However, the results may be an underestimate or over estimate of the effect. The swallow assessment was conducted by speech and language therapists as well as stroke nurses. There has not been any validation of the inter-rater reliability or the inter-rater validity. Some people were assessed up to 7 days after their stroke, so the presence of transient dysphagia may have been missed, as in many cases the dysphagia resolves within 48–96 h [1, 25], and these cases may have been those with a less severe stroke.

The study did not document evidence of pre-stroke swallowing dysfunction however, this problem is unusual in a normal healthy population, and is usually associated with previous co-existing comorbidity. It is likely that this

would have had little impact on the findings. The duration of dysphagia was not documented however, this is no different to previous studies investigating outcome [1, 4, 27].

Despite these difficulties, this is the first study to look at long-term (5-year) outcome with respect to dysphagia with a community-based cohort. Further work is required to examine this association prospectively, with a greater consistency in the swallow assessments and a more frequent follow-up.

Key points

- Dysphagia is a common problem after stroke
 - Dysphagia is an independent predictor of mortality at 3 months
 - Dysphagia after stroke may predict long-term institutionalisation
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Conflicts of interest

There are no conflicts of interest.

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