Dysphagia Following Posterior Fossa Surgery in Adults

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Key words
- Aspiration
- Dysphagia
- Enteral tube
- Posterior fossa

Abbreviations and Acronyms
EFD: Enteral feeding at discharge
MLR: Multiple logistic regression
PEG: Percutaneous endoscopic gastrostomy
p-fossa: Posterior fossa

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OBJECTIVE: **Our study seeks to assess the incidence of aspiration and prolonged dysphagia needing enteral feeding at discharge (EFD) in adults after posterior fossa (p-fossa) surgery.**

METHODS: **A retrospective review was done on 56 patients with p-fossa surgery who needed a swallowing evaluation postoperatively. Questionnaires were sent to patients with EFD. Using univariate and multiple logistic regression analysis, risk factors for aspiration, EFD, and continued enteral feeds were identified.**

RESULTS: **Most patients were male and had p-fossa tumors. Multiple swallowing evaluations were needed in 25 (45%) patients. Aspiration was seen in 23 (41%) and 16 (27%) had EFD. Older age and number of evaluations were significantly associated with both aspiration and EFD ($P < 0.05$). Lateral approach was significantly associated with EFD ($P = 0.047$). In addition, multiple logistic regression identified aspiration as an independent significant predictor for EFD ($P < 0.01$). Mean operative time and tumor location did not have a significant correlation with EFD. At mean follow-up (15 months), only 5/16 needed continued enteral feeds.**

CONCLUSION: **Although 27% patients had EFD after p-fossa surgery, only 5/56 (9%) required continued enteral feeding. Aspiration, age, and lateral surgical approach is associated with EFD. In patients who demonstrate aspiration, we recommend placement of enteral feeding tube. Although most will not require continued enteral feeding at follow-up, longer follow-ups are needed.**

INTRODUCTION

The posterior fossa (p-fossa) is an area including the brain regions and cranial nerves below the tentorium (8). These regions not only are crucial in wakefulness, speech, swallowing, hearing, facial sensation and musculature, and tongue movement, but they are also a common site for many types of tumors, vascular lesions, infection, and congenital abnormalities. Many of these lesions require surgical management (2, 6), and many complications can occur because of crowding of this small space by critical structures. As a result, patients undergoing p-fossa surgery may present with postoperative hydrocephalus, vertigo, deafness, facial numbness or weakness, tongue numbness or weakness, dysphonia, mutism, and dysphagia (1, 2, 4, 6, 8).

A known complication after p-fossa surgery is swallowing dysfunction, or dysphagia (10). Physiologically, swallowing is generally characterized by four stages: an oral preparatory stage, an oral stage, a pharyngeal stage, and an esophageal stage (3, 5, 11). In the event that any these four stages fail, a bolus cannot pass normally from the oral cavity to the stomach and this condition is termed dysphagia (5).

Dysphagia can also occur because of decreased neurologic status as well as impairment of the anatomic structures from the brainstem nuclei to the laryngeal muscles. This may result in disrupted initiation, coordination, or maintenance of swallowing. Common deficits that are present with dysphagia are abnormal tongue movement, poor jaw stability, inefficient chewing, impaired lip seal, multiple swallows to clear a bolus, and lack of awareness of dysphagia (7). Any of these deficits can lead to nutritional deficits, emotional and social disruption, a need for supplementary feeding, and life-threatening aspiration (7, 8, 11). Aspiration can lead to significant problems including pneumonia (7, 8), which is a major cause of mortality in children undergoing p-fossa surgery (9). It is imperative to detect aspiration quickly to prevent such disastrous outcomes (10).

There are several studies that assess swallowing in children after p-fossa surgery, but to our knowledge there are no reported evaluations of postoperative swallowing function in adults. Our study seeks to assess the incidence of aspiration and dysphagia and subsequent outcomes in adults that have undergone p-fossa surgery.

METHODS

A retrospective review was conducted on all patients undergoing p-fossa surgery from July 2007 until September 2010, excluding those cases of neurovascular

decompression in trigeminal neuralgia, after approval from the institutional review board. Data on 56 patients who had p-fossa surgery at the LSUHSC-Shreveport over a 3-year period was analyzed to evaluate swallowing function following surgery and determine risk factors for postoperative aspiration and dysphagia. For those patients that were manifesting aspiration and/or dysphagia, further analysis was performed to evaluate the number and type of swallowing evaluations as well as status of swallowing function at discharge. A certified speech/language pathologist did bedside swallowing evaluations if patients deemed to be at any risk for aspiration or dysphagia by the neurosurgical team and/or nursing staff. Clinical findings that warranted further evaluation included having the patient swallow water and observing for the presence of breathlessness, wet hoarseness, or coughing. Evaluations were sometimes performed multiple times to account for improvement in postoperative examination. Barium swallow studies were done if bedside evaluation was not adequate or if aspiration was exhibited by the patient. "Silent" aspiration was radiologically confirmed with x-ray demonstration of contrast material passing through the vocal cords into the larynx. Enteral feeding tubes were placed 10–14 days postoperatively in those patients with enteral feeding at discharge (EFD). Patients who continued to demonstrate swallowing dysfunction at discharge were identified for further follow-up. Association was sought between two main outcomes—postoperative aspiration and EFD from hospital. We chose EFD as an intermediate outcome measure of swallowing function, with the need for prolonged enteral feeding as a final outcome measure. Sixteen patients failed their last swallow evaluation before discharge and were discharged with EFD. These patients were followed postdischarge and evaluated for dysphagia and long-term feeding through enteral tubes with follow-up questionnaires administered to the patients or their immediate caretakers.

Statistical Techniques

Chi-square or Fisher test were used to evaluate the association between outcome measures and categorical variables. Wilcoxon rank-sum test was used to compare continuous variables such as age and number of swallowing studies and also used to compare average follow-up time and discomfort level between patients with and without continued enteral feeding. Next, multiple logistic regression analysis was used to determine independent significant factors for swallowing dysfunction. Correlation between aspiration and dysphagia was determined along with EFD. The duration of extended enteral feeding for those with EFD was determined and additionally, sex, pathology type, location of tumor, operative time, preoperative dysphagia, difficulties with speech and tongue movements, and level of discomfort were all evaluated for this group.

RESULTS

Data on 56 patients who had p-fossa surgery at the LSUHSC-Shreveport over a 3-year period (2007–2010) were analyzed to evaluate swallowing function following surgery and determine risk factors for postoperative aspiration and dysphagia. Of the 56 patients with p-fossa surgery and swallowing evaluations, 25 patients had multiple tests and there were a total of 92 swallowing evaluations (Table 1). The majority of the patients were male (57.1%) and most had p-fossa tumors as the primary pathology (62.5%). Postoperatively, 23 (41.1%) aspirated at least once during hospital stay and 16 (28.6%) had EFD. The same factors appeared to contribute to both the incidence of aspiration and EFD, namely, age, number of evaluations, result of last swallow evaluation, and having barium for last study. A lateral sub-occipital surgical approach was significantly associated with EFD ($P = 0.047$) but not with aspiration ($P = 0.09$). In our study, EFD was significantly associated with aspiration and vice versa; the corollary being that there was significant correlation between incidence of aspiration during hospitalization and the need for EFD.

Significantly higher proportions of patients with aspiration were observed among those with barium swallow study as their last swallow study prior to discharge (82.4%), and those who had multiple swallow evaluations postoperatively (88%). Significantly, the patients who demonstrated aspiration during the postoperative phase formed a much higher proportion of those with EFD (93.8%) than those without EFD (20%) ($P < 0.01$) (Table 2). A higher proportion of patients with EFD were also observed in those with barium as their last swallow study (58.8%), and those needing multiple swallow evaluations (56.0%). Surgical approach to the p-fossa also significantly affected the occurrence of EFD, with the

Table 1. Summary Statistics on Patient Characteristics and Outcomes and Factors Significantly Associated with Aspiration and Dysphagia ($N = 56$)

Characteristic/ Outcome	Number (%) or Mean ± SD, Median, Range
Male	32 (57.1)
Female	24 (42.9)
Pathology	
Abscess	1 (1.8)
Vascular	17 (30.4)
Congenital	2 (3.6)
Tumor	35 (62.5)
Stroke	1 (1.8)
Multiple swallow evaluations*†	25 (44.6)
Enteral feeding at discharge (EFD)*	16 (28.6)
Aspiration†	23 (41.1)
Last swallow study was Barium*†	17 (20.4)
Location along brainstem—pons—medullary axis	
Intraparenchymal	7 (12.5)
Lower	25 (44.6)
Upper	21 (37.5)
Upper/lower	3 (5.4)
Approach†	
Lateral	34 (60.7)
Midline	22 (39.3)
Age (years)*†	49.3 ± 17.5, 51.0, 8–81
Number of evaluations*†	1.6 ± 1.1, 1.0, 1–8
Operative time (minutes)	285.6 ± 156.1, 237.5, 45–724

*Significantly associated with aspiration during hospitalization.
†Significantly associated with enteral feeding at discharge (or EFD).

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