



# Long term self-reported post-operative outcomes of endoscopic and open pharyngeal pouch repairs

Mostafa Alwan<sup>1</sup>, Debra Phyland<sup>1,2</sup>, Eduard Pudel<sup>1,2</sup>, Emma Booth<sup>2</sup>, Neil Vallance<sup>1,2</sup>

<sup>1</sup>Department of Otolaryngology, Head and Neck Surgery Monash Health, Melbourne, Australia; <sup>2</sup>Department of Surgery, Monash University, Melbourne, Australia

**Contributions:** (I) Conception and design: M Alwan, D Phyland, E Pudel, N Vallance; (II) Administrative support: None; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: M Alwan; (V) Data analysis and interpretation: M Alwan, D Phyland, E Booth; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

**Correspondence to:** Mostafa Alwan, MBBS (Hons). Department of Otolaryngology, Head and Neck Surgery, Monash Health, 823-865 Centre Road, Bentleigh East Victoria 3165, Australia. Email: ENT\_research@monashhealth.org.

**Background:** In recent years, there has been a shift to treating pharyngeal pouches endoscopically, however few studies report the long-term functional outcomes of patients following these repairs. Our aim is to investigate and compare the self-reported long-term functional outcomes of endoscopic and open pharyngeal pouch repair.

**Methods:** A retrospective cohort analysis was performed using patient records to identify patients who had undergone either an open or endoscopic pharyngeal pouch repair from 2002-2018. Patients were then contacted and interviewed regarding their current swallowing status according to the M.D. Anderson Dysphagia Inventory (MDADI).

**Results:** Of 185 identified, a total of 73 (37 female, mean age 77.4±10 years) participants were interviewed. Sixteen patients had undergone an open repair, and 57 endoscopic repair. Mean time interval between surgery and completion of interview was four years and three months (range, 3 months – 14 years 6 months). Overall mean global score for MDADI was 76.2±15 across all participants, 76.1±14.4 for endoscopic repair participants, and 76.4±17.9 for open repair participants. A Mann-Whitney U test comparing global MDADI of both procedure types was non-significant  $U = 445$ ,  $P = 0.883$ , two-tailed.

**Conclusions:** These findings suggest that decisions as to which surgical technique to select for pharyngeal pouch repair may be made according to surgical preference or other considerations other than concern over long-term patient swallowing outcomes. Our results indicate there is no statistically significant difference between endoscopic versus open pharyngeal pouch repair with regards to long-term patient-reported swallowing function.

**Keywords:** Swallowing; pharyngeal pouch; Zenker's; long term outcomes

Received: 13 November 2018; Accepted: 06 May 2019; Published: 17 May 2019.

doi: 10.21037/ajo.2019.05.01

View this article at: <http://dx.doi.org/10.21037/ajo.2019.05.01>

## Introduction

A pharyngeal pouch or Zenker's diverticulum originates from a dehiscence in Killian's triangle due to dysfunction of the cricopharyngeal muscle (1). Reduced wall compliance and increased hypopharyngeal bolus pressure can cause

impaired opening of the upper oesophageal sphincter, which is considered a main physiological cause of this diverticulum (2,3). Although prevalence studies are lacking, it is most commonly reported in elderly males since the oesophagus has been exposed to prolonged pressure and gastroesophageal reflux (1). Other risk factors include

laryngopharyngeal reflux, and muscular dysmotility disorders. Prevalence of this disorder will increase alongside the aging population (1). Common symptoms of Zenker's diverticulum are largely dependent on the pouch size and the degree of cricopharyngeal abnormality but include dysphagia, weight loss, regurgitation, halitosis and aspiration possibly leading to pneumonia (1). The initial clinical investigation to assess for the presence of a pouch is typically a barium swallow although manometry may also be useful in the evaluation of the cricopharyngeal dysfunction and resulting swallow impairment (4).

Treatment is indicated for the majority of cases of pharyngeal pouch, especially when the patient is symptomatic, regardless of pouch size (5). Traditionally an open procedure (OP) had been used to correct the defect but in 1958 Gösta Dohlman described a method of endoscopic cauterization and division of the cricopharyngeus muscle to treat pharyngeal pouches (6). In 1993, the stapling device was introduced (7,8) which involves the use of the Weerda diverticuloscope, to achieve transoral division of the septum between the oesophagus and the pouch, with a simultaneous cricopharyngeal myotomy. Since then endoscopic stapling (ES) diverticulotomy has become increasingly popular.

Although not widely researched, it is commonly asserted that there are lower complication rates with ES as opposed to OP pharyngeal pouch repairs. In 2007, Lang *et al.* (9) compiled four years of data and published a 2.6% morbidity rate with endoscopic stapling diverticulotomy, a 7.6% morbidity with diathermy and an 11.8% morbidity with open transcervical approach. In contrast, more recently in 2016, Albers *et al.* (5) performed a systematic review and meta-analysis of endoscopic versus surgical approach for pharyngeal pouch repair. The results suggested that whilst endoscopic treatment resulted in shorter procedure time and hospital length of stay it was also associated with a higher rate of symptom recurrence (5). To date, however, there has been little published research investigating the long-term patient-perceived functional outcomes of ES including complication and revision rates. This study investigates the long term self-reported swallowing outcomes of post endoscopic and open repair of pharyngeal pouches within Monash Health, Victoria, Australia. Complication rates and pouch revisions were also analysed. The Ear Nose and Throat Department is a busy unit operating over four separate hospitals and reported long-term outcomes for pharyngeal pouches previously (10).

## Methods

### Design

After obtaining approval from Monash Health Ethics Committee (HREC Ref: 15121L), a retrospective cohort analysis was performed using written and electronic data (scanned and physical medical hospital records) from the single health network, Monash Health.

A total of 185 patients who either had an endoscopic or open pharyngeal pouch repair from 2002–2018 at Monash Health were identified via a surgical database and medical records. Of these cases, 101 were either deceased or deemed unable to participate on unrelated medical grounds, communication status or had incomplete data. Phone contact inviting patients to participate in the study was undertaken where phone numbers were available. Of the 84 able to be contacted, 11 declined. A total of 73 participants consented to participate in the study and were interviewed via the phone regarding their perceived current functional swallowing status according to the MD Anderson Dysphagia Index (11). Once the interviews, demographic and surgically-related information had been collected from each participant's medical records, all data were de-identified to ensure anonymity and confidentiality.

### M. D. Anderson Dysphagia Inventory (MDADI)

Chen *et al.* developed the M. D. Anderson Dysphagia Inventory (MDADI) in 2001 for use with people with head and neck cancer (11). The questionnaire is designed to capture dysphagia-specific quality of life issues and consists of 20 items grouped into four subscales; global, functional, emotional and physical. Each item is scored 1 to 5, and the overall score multiplied by 5 to give a score out of 100 with higher scores indicating increased quality of life (11). The MDADI was the first published validated reliable questionnaire designed for evaluating the perceived impact of dysphagia on quality of life (QoL). Although this instrument was primarily designed for use with the head and neck cancer population, it had been used in the previous decade within the ENT Department for peri-operative evaluation of patients with pharyngeal pouch. We therefore chose this swallowing-related QOL tool to be consistent with historic departmental processes and for potential comparative evaluation.

### Statistical analysis

Statistical analysis was performed using SPSS v21.0.

## Results

Seventy-three patients who underwent pharyngeal pouch repair surgery were included in this study, 37 females and 36 males, aged between 57 and 97 years (mean 77.4±10 years). They were divided into two groups; open repair (n=16) and endoscopic repair (n=57). Twelve patients in total had revision repairs done but only the type of procedure for the final repair was counted in the group allocation (three open and nine endoscopic). Three patients previously had endoscopic stapling attempted which was abandoned intra-operatively due to technical difficulties. Of these, two patients went on to have successful endoscopic stapling and one had open repair. The mean time interval between surgery and completion of the MDADI was four years and three months (range, 3 months – 14 years 6 months). Overall global score for the MDADI across all patients was 76.2±15.1. Patients who had endoscopic repair (n=57) reported an overall mean score of 76.1±14.4, and patients who had an open repair (n=16) reported an overall mean score of 76.4±17.9. The twelve patients who had undergone revision repairs reported a mean total score of 72±19.7.

A Mann-Whitney U test (with  $\alpha = 0.05$ ) was conducted to compare the Total MDADI Scores of both procedure types. The result was non-significant,  $U = 445$ ,  $P = 0.883$ , two-tailed, suggesting that long-term perceived swallowing function according to MDADI scores ( $M = 70.89$ ) for Endoscopic procedures (Mean Rank = 36.81,  $n = 57$ ) does not differ to any significant degree from Open procedures (mean rank = 37.69,  $n = 16$ ). This was a small effect ( $r = 0.02$ ) so it is possible that the sample was too small to detect differences.

Of the 73 patients, 12 had undergone revision procedures (16%), while 61 had not (84%). 18.6% of the original endoscopic procedures and 7.1% of the original open needed repeats. Of the revision repairs then undertaken, 9 were endoscopic and 3 were open procedures. A Chi-square analysis (with  $\alpha = 0.05$ ) examining the relationship between revision procedures and procedure type showed no significant difference  $X^2 = 430$ ,  $P = 0.620$ , two-tailed, although this was with a small effect size ( $r = 0.06$ ).

Similarly, a Mann-Whitney U test comparing total MDADI scores for the revision group with the one procedure group showed no significant difference  $U = 246.5$ ,  $z = -1.46$ ,  $P = 0.14$  but again with a small effect size ( $r = 0.17$ ).

## Discussion

Zenker's diverticulum can cause a range of symptoms

affecting patient's quality of life. Among these dysphagia and food regurgitation are the most important. Over the last decades, treatment of Pharyngeal pouch has shifted from open transcervical to endoscopic transoral therapy since the introduction of the stapling device in 1993 (12). Endoscopic techniques have also been reported to have a reduced mean time to start on a normal diet, a shorter mean length of hospital stay, and a lower overall complication rate when compared with open techniques (9,12). However, few studies have examined long term outcomes as perceived by patients after pharyngeal pouch repair (5,6,13), comparing open versus endoscopic repair techniques, especially in Australia.

The results of this retrospective cohort analysis to assess and compare long term post-operative dysphagia-related QOL outcomes in open versus endoscopic repair provides an estimation of median MDADI values in both groups, as a preliminary means to determine patient-perceived swallowing outcomes. Although the sample number in this study was small so potential differences may not have been detected, there were no differences shown in long-term post-operative perceived swallowing function between the two procedure groups. The endoscopic repair median MDAI score was 76 (range, 43–100) and the open repair median score was 75.5 (range, 34–100) so the outcome scores were all deemed positive ranging from moderate to high functioning.

In addition, we report a recurrence rate of 18.6% among patients originally treated with endoscopic repair, and 7.1% in those originally treated with open repair. This is in keeping with several previous studies looking at the recurrence rates of these two approaches (14–17).

There have been several studies conducted regarding the immediate and short-term swallowing-related quality of life (SrQoL) outcomes following pharyngeal pouch repair that have utilised the EAT-10 (18), the SWAL-QOL (19), and the MDADI (20). In 2016, Van Abel *et al.* demonstrated a perceived improvement in short-term SrQoL outcomes following endoscopic repair of Zenker's diverticulum using the EAT-10 scale (18). Similar to this study, Skaug *et al.* used the MDADI (with an additional two questions added by the investigating team) to assess functional outcomes one-year post laser diverticulotomy (20). The results showed a significant improvement between the pre-operative MDADI score and one year post operatively in all subscales of MDADI. Colpaert *et al.* [2017] looked at endoscopic repair of Zenker's diverticulum as a whole similar to this study, and demonstrated an improvement

between pre- and post-endoscopic repair using the SWAL-QOL questionnaire, with a mean interval between surgery and post-operative survey of 85 days (19). However, these studies did not directly compare swallowing-related quality of life outcomes between endoscopic and open repairs, nor did they have a long-term follow-up.

Whilst it has been previously reported that endoscopic pharyngeal pouch repair is associated with a significant increase in symptom recurrence (15,21), there is little data available comparing the quality of life outcomes of revision repairs to primary pharyngeal pouch repairs, and the existing data does not reach similar conclusions. Studies have looked at length of stay, and overall symptom improvement comparing these two groups, but have not used a validated and standardised scoring mechanism (21,22). Adam *et al.* [2013] compared the use of laser and stapler in revision pharyngeal pouch repairs and found that patients with revision repairs had longer hospital stays than primary repairs (22), but did not comment on their long-term quality of life impact. Palmer *et al.* [2000] investigated whether endoscopic staple-assisted diverticulotomy outcomes were influenced by patient demographic factors but found no significant difference in patient outcomes (measured by degree of food avoidance, regurgitation, dysphagia for pills, choking, coughing, reflux and halitosis), regardless of patient demographic duration of pre-operative symptoms, diverticulum size, time since surgery or number of previous surgeries (21).

Interestingly, our results did not demonstrate significant differences in the MDADI total or subscale scores between patients who required revision repairs and those that did not, or according to the revision procedure type. This finding however must be interpreted with caution due to the small numbers. Predictors of pharyngeal pouch repair has been a minimally investigated area. In a recent study Dissard *et al.* identified small pouch size as an identifiable recurrence risk factor for endoscopic Zenker's diverticulum repair after retrospective review of 9 recurrence cases from their sample of 50 (15).

Limitations of the study include the small number of participants, the grouping of various endoscopic techniques (laser or stapler) used in the treatment for Zenker's Diverticulum into one group and that there were inadequate numbers of pre-operative MDADI available for post-operative comparison

The usefulness of the MDADI for this population is also not established and it is possible the tool lacked the sensitivity to detect differences. In future studies it is

recommended that patient perception of swallow function be evaluated using validated QoL scales with strong psychometric properties (23) such as EAT-10 and SwalQoL, as now routinely adopted by the ENT Department and as previously reported in other studies.

Instrumental evaluation (for example, with functional imaging or endoscopy) of long-term swallow function would also have been of obvious interest to determine the relationship between patient perception and objective measures of repair success.

In addition, the size of pharyngeal pouch was not standardly measured, as this data was not routinely available on our imaging systems, and therefore the relationship between severity of disease and treatment option cannot be evaluated.

In view of the limitations identified, our findings should be interpreted with caution. However, since the main aim of this study was to compare patients' perceptions of long-term swallow-related QoL after undergoing endoscopic techniques or open transcervical pharyngeal pouch repair, our data do suggest there is little to no difference between the two procedures in these aspects. Our paper has also shown there is a low rate of repeat surgery being required and suggests that type of surgical technique doesn't influence recurrence rates then requiring revision surgery.

## Conclusions

The reported study provides the first long-term patient-reported swallowing-related quality of life assessment using the MDADI, comparing functional outcomes between endoscopic and open repair of Zenker's diverticulum. Although the sample size is small, the results suggest there is no difference between the two groups on long-term patient-reported swallowing-related quality of life.

These findings suggest that the decision as to which surgical technique to select for pharyngeal pouch repair may be made according to surgical preference or other considerations than concern over differences in long-term outcomes with one technique than another. This may also aid in pre-operative patient counselling regarding long term quality of life improvement expectations. Further investigations are recommended to specifically compare outcomes in endoscopic primary versus revision pharyngeal pouch repair.

## Acknowledgements

Joo Koh for his help in the initial part of the research design and Eren Tan for assistance with data collection.

## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Ethical Statement:* Obtaining approval from Monash Health Ethics Committee (HREC Ref: 15121L).

## References

1. Aiolfi A, Scolari F, Saino G, et al. Current status of minimally invasive endoscopic management for Zenker diverticulum. *World J Gastrointest Endosc* 2015;7:87-93.
2. Cook IJ, Gabb M, Panagopoulos V, et al. Pharyngeal (Zenker's) diverticulum is a disorder of upper esophageal sphincter opening. *Gastroenterology* 1992;103:1229-35.
3. Venturi M, Bonavina L, Colombo L, et al. Biochemical markers of upper esophageal sphincter compliance in patients with Zenker's diverticulum. *J Surg Res* 1997;70:46-8.
4. Henry MA, Lerco MM, Tagliarini JV, et al. Pharyngoesophageal diverticulum: evaluation of treatment results. *Rev Col Bras Cir* 2013;40:104-9.
5. Albers DV, Kondo A, Bernardo WM, et al. Endoscopic versus surgical approach in the treatment of Zenker's diverticulum: systematic review and meta-analysis. *Endosc Int Open* 2016;4:E678-86.
6. Holinger PH, Johnston KC. Endoscopic surgery of Zenker's diverticula; experience with the Dohlman technique. *Ann Otol Rhinol Laryngol* 1961;70:1117-23.
7. Collard JM, Otte JB, Kestens PJ. Endoscopic stapling technique of esophagodiverticulostomy for Zenker's diverticulum. *Ann Thorac Surg* 1993;56:573-6.
8. Martin-Hirsch DP, Newbegin CJ. Autosuture GIA gun: a new application in the treatment of hypopharyngeal diverticula. *J Laryngol Otol* 1993;107:723-5.
9. Lang RA, Spelsberg FW, Winter H, et al. Transoral diverticulostomy with a modified Endo-Gia stapler: results after 4 years of experience. *Surg Endosc* 2007;21:532-6.
10. Gomes F, Pudel E. The endoscopic stapling of pharyngeal pouches: long term patient outcomes. *Capsula Eburnea* 2009;26:99-105.
11. Chen AY, Frankowski R, Bishop-Leone J, et al. The development and validation of a dysphagia-specific quality-of-life questionnaire for patients with head and neck cancer: the M. D. Anderson dysphagia inventory. *Arch Otolaryngol Head Neck Surg* 2001;127:870-6.
12. Verdonck J, Morton RP. Systematic review on treatment of Zenker's diverticulum. *Eur Arch Otorhinolaryngol* 2015;272:3095-107.
13. Bonavina L, Bona D, Abraham M, et al. Long-term results of endosurgical and open surgical approach for Zenker diverticulum. *World J Gastroenterol* 2007;13:2586-9.
14. Mazza M, Bergamini AN, Parise P, et al. Treatment of Zenker's Diverticulum With Endoscopic Stapled Esophago-diverticulostomy (ESD): Analysis of Long-term Outcome. *Surg Laparosc Endosc Percutan Tech* 2017;27:445-8.
15. Dissard A, Gilain L, Pastourel R, et al. Functional results in endoscopic Zenker's diverticulum surgery. *Eur Ann Otorhinolaryngol Head Neck Dis* 2017;134:309-13.
16. Ciuc D, Birla R, Panaitescu E, et al. Zenker Diverticulum Treatment: Endoscopic or Surgical? *Chirurgia (Bucur)* 2018;113:234-43.
17. Veivers D. Pharyngeal pouch: which technique? *J Laryngol Otol* 2015;129 Suppl 3:S30-4.
18. Van Abel KM, Tombers NM, Krein KA, et al. Short-term Quality-of-Life Outcomes following Transoral Diverticulotomy for Zenker's Diverticulum: A Prospective Single-Group Study. *Otolaryngol Head Neck Surg* 2016;154:322-7.
19. Colpaert C, Vanderveken OM, Wouters K, et al. Changes in Swallowing-related Quality of Life After Endoscopic Treatment For Zenker's Diverticulum Using SWAL-QOL Questionnaire. *Dysphagia* 2017;32:339-44.
20. Skaug HP, Geirdal AO, Brondbo K. Laser diverticulotomy for Zenker's diverticulum--does it improve quality of life? *Eur Arch Otorhinolaryngol* 2013;270:2485-90.
21. Palmer AD, Herrington HC, Rad IC, et al. Dysphagia after endoscopic repair of Zenker's diverticulum. *Laryngoscope* 2007;117:617-22.
22. Adam SI, Paskhover B, Sasaki CT. Revision Zenker diverticulum: laser versus stapler outcomes following initial endoscopic failure. *Ann Otol Rhinol Laryngol* 2013;122:247-53.
23. Speyer R, Cordier R, Kertscher B, et al. Psychometric properties of questionnaires on functional health status in oropharyngeal dysphagia: a systematic literature review. *Biomed Res Int* 2014;2014:458678.

doi: 10.21037/ajo.2019.05.01

**Cite this article as:** Alwan M, Phyland D, Pudel E, Booth E, Vallance N. Long term self-reported post-operative outcomes of endoscopic and open pharyngeal pouch repairs. *Aust J Otolaryngol* 2019;2:15.