



# Risk and Pathogenesis of Dysphagia Related to Antireflux Surgery

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# THESIS ABSTRACT

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Dysphagia, the difficulty of swallowing food or drink, is experienced by some patients with gastro-oesophageal reflux disease and is a common adverse effect of antireflux surgery, a procedure involving diaphragmatic hiatal repair and fundoplication. Dysphagia after surgery in the absence of recognisable anatomical abnormalities is poorly understood and thus difficult to treat. Despite modifications to surgical techniques, post-operative dysphagia remains unpredictable (Chapter 1). My aim is to identify patients at risk and the causes of dysphagia related to antireflux surgery.

A fundamental premise of this thesis is that objective measurements hold the key to understanding post-fundoplication dysphagia. Five prospective studies are presented which evaluate oesophageal body or oesophago-gastric junction (OGJ) function with regards to: early new-onset and late persistent post-operative dysphagia. Objective data were gathered using: i) luminal manometry alone; ii) impedance combined with manometry, to assess relationships between oesophageal pressure and bolus flow; and iii) three-dimensional pressure recordings of expiratory and inspiratory radial OGJ pressure to assess the contribution of hiatal repair and fundoplication to post-operative dysphagia.

These studies show: an 'oesophageal ileus' in the early post-operative period, with global failure of primary peristalsis in 70% of patients after total fundoplication, compared with 20% of patients after cholecystectomy. Oesophageal ileus is transient with subsequent return of pre-operative motility patterns (Chapter 2). Of all patients undergoing laparoscopic antireflux surgery in the Unit (tertiary care hospital), the incidence of late revisional surgery is low at 5.6%, including 3% for persistent dysphagia. Dysphagia is the most common indication for revisional surgery, albeit with lower patient satisfaction with outcome than revisional surgery for recurrent reflux (Chapter 3).

In addition, flawed interaction between oesophageal and OGJ function is implicated in dysphagia. OGJ resistance to outflow is associated with dysphagia when there is sub-optimal distal oesophageal contractile strength and relatively high OGJ relaxation pressure on swallowing (Chapter 4). Limited tools for impedance-manometry data analysis inspired the conceptualisation and development of new automated combined pressure-flow analysis, achieved through scientific collaboration. This novel approach revealed for the first time that some patients have a pre-existing, asymptomatic, subtle variation of viscous bolus compression and movement in relation to oesophageal peristalsis that increases the risk of new-onset post-operative dysphagia (Chapter 5).

Fundoplication and hiatal repair alter OGJ anatomy to prevent reflux. However, after surgery, aberrant asymmetry of radial OGJ pressure during inspiration is associated with persistent dysphagia, consistent with a focally restrictive diaphragmatic hiatus from crural repair (Chapter 6).

In conclusion, oesophageal ileus in the early post-operative period is transient and the rate of late revisional surgery for troublesome dysphagia is low. Post-surgical dysphagia is related to a pre-existing pattern of sub-optimal bolus transport; and after surgery, inadequate modulation of oesophageal function in response to altered OGJ function. When antireflux surgery results in abnormally skewed OGJ pressures, dysphagia may be due to a 'snug' hiatal repair. Future studies hold promise for a reduction in post-surgical dysphagia through examination of local intrinsic modulation of swallowing function and development of objective calibration of hiatal repair.

# THESIS DECLARATION

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This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Jennifer C Myers and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference had been made in the text.

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## PUBLISHED WORKS

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**Myers JC**, Jamieson GG, Wayman J, King D, Watson DI. Esophageal ileus following laparoscopic fundoplication. *Dis Esoph* 2007; 20: 420-7.

- *Published by John Wiley & Sons Ltd for © International Society for Diseases of the Esophagus (Online ISSN 1442-2050). The original publication doi: [http://dx.doi.org/ 10.1111/j.1442-2050.2007.00643.x](http://dx.doi.org/10.1111/j.1442-2050.2007.00643.x) is available at Diseases of the Esophagus, electronic link: [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1442-2050](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1442-2050)*

Lamb PJ, **Myers JC**, Jamieson GG, Thompson SK, Devitt PG, Watson DI. Long-term outcomes of revisional surgery following laparoscopic fundoplication. *Br J Surg* 2009; 96: 391-7.

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**Myers JC**, Jamieson GG, Sullivan TR, Dent J. Dysphagia and gastro-esophageal junction resistance to flow following partial and total fundoplication. *J Gastrointest Surg* 2012; 16: 475-85.

- *Published by Springer-Verlag New York © Springer International Publishing AG, Part of Springer Science+Business Media (Print ISSN 1091-255X; Online ISSN 1873-4626). The original publication doi: <http://dx.doi.org/10.1007/s11605-011-1675-7> is available at electronic link: <http://link.springer.com/journal/11605>*

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- *Published by Wiley, Chichester, West Sussex UK © John Wiley & Sons Ltd (Online ISSN 1365-2982). The original publication doi: <http://dx.doi.org/10.1111/j.1365-2982.2012.01938.x> is available at electronic link: [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1365-2982](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2982)*

**Myers JC**, Jamieson GG, Szczesniak MM, Estremera- Arévalo F, Dent J. Aberrant esophago-gastric junction radial pressures are associated with troublesome post fundoplication dysphagia. *Neurogastroenterol Motil*. Submitted Feb 2016.

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# ABBREVIATIONS

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3-D	Three-dimensional
AGA	American Gastroenterological Association
AIM	Automated impedance manometry
CFV	Contractile front velocity
DCI	Distal contractile integral
DRI	Dysphagia risk index
EAES	European Association of Endoscopic Surgery
Fr.	French size (external diameter) of the French gauge system
HRIM	High-resolution impedance manometry
HRM	High-resolution manometry
IBP	Intrabolus (or ramp) pressure
IQR	Interquartile range
IRP	Integrated relaxation pressure
LOS	Lower oesophageal sphincter
MCT	Multi-centred randomised trial
OGJ	Oesophago-gastric junction
PPI	Proton pump inhibitor
QoL	Quality of life
RCT	Randomised controlled trial
TGA	Therapeutic Goods Administration (Australia)
TLOS	Transient lower oesophageal sphincter relaxation
US-FDA	Food and Drug Administration, U.S.A.
VAS	Visual analogue scale