

## **DYSPHAGIA RESEARCH SOCIETY 20<sup>TH</sup> ANNUAL MEETING**



**March 8-10, 2012**

*Post-Graduate Course: March 7, 2012*

**The Ritz-Carlton Toronto, Ontario, Canada**

### **DRS FEEDBACK: Niamh Barrett & Ciara Murphy**

This year the Dysphagia Research Society (DRS) celebrated its 20<sup>th</sup> Anniversary and held the annual meeting in Toronto, Canada from the 8<sup>th</sup>-10<sup>th</sup> March 2012. In addition this year, they celebrated their international members with over 400 delegates attending representing over 30 nations including the USA, Canada, Asia, New Zealand, Australia and a high European attendance including five Irish delegates! In 20 years the DRS has evolved to be a multi-professional and truly international Society of researchers and clinicians that conduct high quality research across the entire spectrum from the basic science to implementation with knowledge translational research to achieve many more successes in the field of dysphagia.

This years meeting focused on new areas of dysphagia research, in particular how neuroplasticity can be utilized to diminish the impairment of dysphagia and ultimately provide viable and effective treatments for our patients. Hence the title – *Stretching the Limits: Plasticity and Neural Control of Swallowing*. The annual meeting objectives were to:

- Recognise how current understanding of neuroplasticity in domains other than dysphagia (e.g. limbs, cognition, etc.) can enhance our understanding of dysphagia rehabilitation
- Discuss appropriate criteria regarding enhancing radiation induced fibrosis and swallowing and develop strategies for incorporating these criteria into everyday practice
- Recognise the evolution of dysphagia research and how this will direct future dysphagia research and therapy
- Identify the newest topics and results in clinical research related to neuroplasticity and recovery and how to apply research to patient recovery

Given the extent of the programme schedule (which commenced daily at 7am!) it is not possible to review all of the presentations. The schedule was divided into specific topic lectures, scientific paper presentations and scientific poster viewing sessions. The following provides an overview of the main themes which emerged over the three days including:

#### **Head & Neck Cancer and Radiotherapy**

Dr Andrew Hope, MD from the Princess Margaret Hospital in Toronto presented on '*Radiation Treatment as a cause for dysphagia: current knowledge and future goals*'. He opened his talk with a question: what do patients diagnosed with head

and neck cancer want? And the answer was of course to be cured and to live longer. He went on to state that survival is paramount for the patient; it overshadows toxicity and side effects at least in the initial stages. Research has shown continuous treatment is better even though side effects are more likely.

The side effects of radiation are many and include mucositis, dermatitis, fatigue and xerostomia. Randomized control trials have looked at increasing the intensity of treatment and the effects of this. Dr Hope reports the benefit of more intense treatment is questionable. Increasing the intensity of treatment increases toxicity. He returned to the statement he had made previously regarding the patient's will to survive overshadowing toxicity and side effects and stated from a patient perspective, death from toxicity of treatment versus death from cancer is the same.

He discussed treatment options for example Intensity-Modulated Radiation Therapy (IMRT). He reported IMRT is not always better because it results in low dose splash radiation. He also discussed the option of doing IMRT on top and traditional radiation lower (blocking the larynx) but if you do not transition correctly you can have failure where the match line is and reoccurrence can be fatal. He noted that Radiation Oncologists are avoiding radiating the parotids to improve rates of salivary flow but this has not resulted in improvements in patients' quality of life with patients reporting they still feel 'dry'. If you give more than 26-30 gray to the parotid and 26-40 gray to the submandibular gland, they 'shut down'. He stated that we cannot always avoid the submandibular glands because there are neck nodes in this area. He also reported that Radiation Oncologists need to be very judicious when avoiding treating areas as cancer may be missed or reoccur.

Dr Hope stated that we need to individualise and adapt our procedures. Some patients have dysphagia pre-treatment and we need to identify these patients. Radiotherapy causes difficulty with mastication, salivary flow and swallowing. We need to predict patients who are at high risk of dysphagia. Studies are showing dysphagia post treatment is associated with dose and phenotype. Dr Hope recommends trying to use less than 50 gray to swallowing muscles. He also reported that in his opinion single treatment (chemoradiotherapy or surgery) is better than dual treatment (surgery and chemoradiotherapy). Studies have looked at the effect of radiation sensitive genes. Dr Hope stated that we need to identify patients who have highly sensitive tumors and treat these patients accordingly. He also reported the Human Papillomavirus (HPV) is changing the way we treat cancer. HPV associated tumours appear to have a better response to treatment. It may be better to have radiation alone in the HPV population. However he reported when the cancer reoccurs in HPV it is very difficult to treat.

Dr Jonathan Irish MD, FRCSC, FACS, Chief Surgical Oncology, Princess Margaret Hospital. Toronto presented on 'Looking Forward: The Vision in 2020'. He reported 'I produce collateral damage' and the need for reducing this

collateral damage. He discussed the importance of targeting the tumour and targeting areas you want to avoid. He discussed the technology that is now available when treating a patient and how far we have progressed in terms of technology. Imaging is such now that a surgeon can virtually remove a tumour prior to surgery (3D visualisation). He envisaged a virtual Fiberoptic Endoscopic Evaluation of Swallowing (FEES) service in the future where evaluation of swallowing and dosimetry would occur simultaneously. His mantra was 'create, innovate, translate, evaluate and educate'. We need to apply scientific rigor to all that we do!

Carnaby and colleagues presented a paper on dysphagia prevention exercises in head and neck cancer. This was a Randomised Control Trial (RCT) which evaluated two levels of exercise on the maintenance of muscle composition and function for swallowing in head/neck cancer (HNC) patients undergoing chemo-radiotherapy. 130 patients with HNC were randomized into three treatment groups, usual care (n=28), therapist directed (n=50) and patient directed (n=52).

Patients were treated for six weeks and followed for three months. The sample included 101 male and 29 female. 31 subjects received radiotherapy and 99 received chemo-radiotherapy. Less muscle deterioration was identified in the therapist directed arm compared to patient directed. Functional swallowing, oral intake level and mouth opening deteriorated less in the two Pharyngocise groups. Exercise adherence was lower in the patient directed arm (35% non-adherence in the patient directed group versus 20% non-adherence in the clinician directed group). The authors concluded that patients receiving a therapist assisted program of swallowing exercise during HNC treatment demonstrated superior muscle maintenance and functional swallowing ability than either a patient directed or usual care comparator.

**Note** it was unclear as to exactly what exercises were included in the pharyngocise programme. Contacting the authors to confirm this is recommended.

LaGorio et al. looked at the impact of baseline factors on adherence to a preventative swallowing exercise (pharyngocise) during chemo-radiotherapy (CRT) in head and neck cancer (HNC) patients. This study followed on from the previous. The current study looked at the role of baseline demographic and psychosocial parameters on exercise adherence in this sample.

102 subjects from both exercise intervention arms were asked to complete psychosocial scales for depression, mood, and fatigue before completing CRT. The authors concluded that the presence of depression and fatigue upon starting chemo-radiotherapy can negatively influence patient ability to adhere to a preventative swallowing exercise program. Early recognition and management of these psychosocial factors may improve swallow exercise adherence. Of note, gender and marital status were significantly associated with adherence with

half of women adhering and half not, and married patients more adherent. The authors concluded that XRT/CRT + fatigue + single women = higher risk of non-adherence.

Maclean et al. presented a paper entitled 'Dysphagia is a prevalent and under recognised complication of head and neck radiotherapy'. The purpose of this study was to document the prevalence and clinical severity of dysphagia as a long term complication of head and neck radiotherapy. An observational cross-sectional study was conducted in a large consecutive series of head and neck cancer patients. All patients on the St. George Hospital Cancer Care database, who had received head and neck radiotherapy with curative intent 3-8 years previously and recorded as being alive were contacted by mail (n = 115). Dysphagia severity was measured using the Sydney Swallow Questionnaire (SSQ). The authors concluded that dysphagia is a very prevalent long term complication of head and neck radiotherapy with significant number of patient reporting swallowing dysfunction. Swallowing dysfunction seems to be under-recognised by both patients and their clinicians. The authors also noted that short-term effects may not predict long-term function.

Hutcheson and colleagues reported on chronic dysphagia five years or more after radiotherapy-based treatment of head and neck cancer. The authors note that changes in the profile of head and neck cancer (HNC) are leading to younger survivors with better prognosis for long-term survival, but few studies have examined dysphagia beyond 2 years of treatment. 29 patients treated with radiotherapy (38%) or chemoradiotherapy (62%) were included in the study. The majority (86%) had oropharyngeal cancer, 75% had T2-T3 disease and 24% were N0. Abnormal late exam findings included cranial neuropathy, trismus, radionecrosis, and dysarthria / dysphonia. Modified Barium Swallow (MBS) studies confirmed pharyngeal residue and aspiration in all cases (79% silent) owing to physiologic impairment whereas stricture was confirmed endoscopically in only 7 patients (24%). 86% developed pneumonia half requiring hospitalisation.

Swallowing postures/strategies helped 69% of patients. However, none achieved durable improvement across functional measures and 19 (66%) were gastrostomy dependent. The authors concluded that although functional organ preservation is commonly achieved, severe dysphagia represents a chronic late effect that may develop or progress years after radiation based therapy for head and neck cancer.

The authors strongly recommended counselling patients to expect dysphagia. There is a steady increase in oropharyngeal cancers and steady decline in laryngeal cancers. There is a high survival rate in oropharyngeal cancer. 70%

are HPV related oropharyngeal cancers where a very small portion were HPV related in the 1980s.

### **Animal Studies and Neuroplasticity**

Dr. Dale Corbet presented on: *Neuromodulating Therapies for Acute and Progressive Diseases: How and When to Intervene*. Dr Corbet commenced his presentation with how stroke was viewed in the past as a “humpty dumpty disease” is changing and how neuroplasticity is the key to better stroke recovery. He reported patients do better in specialized rehab units and patients often use compensation that may effect recovery and he drew on the “use it or lose it” principals from Nudo et al 1996 and Kleim et al 2008. Dr Corbet reported dysphagia leads to misuse where neuroplastic change requires dependent activity. Ploughmann and Corbett’s 2004 research on rats looked at treating upper limb dysfunction by combining stimulating environments with specific tasks.

Dr Corbett reported post stroke patients are inactive 75% of the time and are alone 60% of the time where time is of the essence! He recommended commencing treatment not immediately but 4/5 days post stroke (at least within 5-14 days) and after 30 days the effectiveness of treatment dramatically reduces. He reported that there does appear to be a recovery motor plateau 6-10 weeks after injury and he questioned if there is a limit to how much brain plasticity can occur or how we do our therapy. Dr Corbett stresses the need for intensive practice and highlighted that swallow exercise programmes are not reaching the same intensity as we swallow 300 times a day! He also stated that Brain Derived Neuro Factor (BDNF) plays a key role in recovery and a combination or cocktail of therapies are far superior to monotherapies!

His colleague Dr. Theresa Jones then discussed “*Driving ‘Spontaneous’ Neural Plasticity*”. Dr Jones reported that there needs to be interconnections with plasticity and behavioral experience for behavioral change (learning) to take place. Dr Jones reported that because of functional deficits the human response is to make adaptations and behavioral change continues after stroke. She also highlighted that spontaneous recovery is experience dependent (i.e. whether you do anything or not) and that more plasticity does not always equal better function as neuroplasticity is neuroactivity dependent based on our experiences. Dr. Jones then went on to talk about limb studies and how they have shown that the “bad limb” can become worse by overcompensating with the “good limb”. She stated training the “bad limb” for better function improves motor performance in the affected limb and this is compensatory even by using the impaired limb. She also mentioned that TBI is much more challenging than localized stroke and further studies need to look at a “combo of therapies” for this area.

Dr Ruth Martin further discussed neuroplasticity and stressed that enriched environments and specific training leads to better outcomes. Dr Martin stated

that neuroplasticity within the swallowing nervous system includes external, behavioral and non-behavioral (e.g. electric stim, motor training) factors. One very interesting point she made was looking at cognitive factors and how the occurrence of a yawn and swallow are temporally related. She stated that there is a dramatic increase in swallowing rates 10 seconds immediately post yawning and this may be an effective therapy technique by showing pictures or video clips of people yawning to stimulate spontaneous swallowing in patients.

Dr David Mc Farland then gave a short talk on factors influencing feeding and swallowing neuroplasticity including patient factors, structures, physiologic functions, environmental influences and the extent of injury/disease limits what we can actually do. He looked at future actions and reported we need a strategic research plan with parallel pre-clinical and clinical studies investigating effort, food types, mastication, optimal doses of therapy etc that is patient centered.

Dr Emily Plowman is conducting some interesting research using pigs and presented on: *The Development of Oral Motor Dysfunction in Parkinson's Disease*. Her rationale for using pigs was that they are a larger animal and more closely match humans. Dr. Plowman found that the pigs treated with 1-methyl-1-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) had significantly shorter airway closure time and longer mastication cycles while eating the hard pellet diet. She suggested that in the presence of a slower oral preparatory phases in PD simulated animals, the airway is afforded less protection during swallowing. Dr Plowman also received a comment that doing VFU's on pigs is not an easy task! Xin Feng presented on the: *Aging effects on extrinsic tongue muscles in African Green Vervet Monkeys*. Ms Feng examined fiber type composition and cross sectional area in serial sections of muscles in 5 young (8-11 years, equivalent to 30 years in humans) and 5 old (21-26 years, equivalent to 70 years in humans). Ms Feng reported that the geniohyoid showed more atrophy than the genioglossus with ageing and imbalances in their mass and composition with advanced age may contribute to impaired swallowing timing and safety in older adults.

Heidi Kletzien looked at *Tongue Muscle Contractile Properties following targeted tongue exercises versus generalized treadmill exercise in aged rats*. Ms. Kletzien tested 21 young, 23 middle-aged and 21 old rats and distributed them into groups that received targeted tongue exercises, treadmill running or no exercise (5 days/week for 8 weeks- they got weekends off!). Ms. Kletzien's study found that tongue muscle contractile properties were positively affected by both targeted and generalized training. Ms. Kletzien stated that clinically this may be important as even non-specific exercise e.g. treadmill running may also improve muscles for speech and respiration. She stated that targeted tongue exercise may improve fatigue to a greater extent than generalized exercise however further studies need to examine optimizing dose and manner of these exercises.

### **High Resolution Manometry/Impedance: The P-E Segment**

Benson T Massey, MD, FACP, Professor of Medicine Director, GI Manometry Lab , Medical College of Wisconsin presented on 'High Resolution Manometry/Impedance: The P-E Segment. He commenced his presentation with a definition of manometry. He stated clinical manometry is the recording of the pressure applied to a pressure sensor residing within the lumen of interest. High resolution manometry (HRM) is the use of closely spaced (typically 1 cm) pressure sensors to record the spatial (axial) distribution of pressures within the lumen of interest over time. He noted that there has been no rigorous analysis to determine the spacing necessary for manometry to be "high-resolution".

Professor Massey reported that one can *infer* the spatial location and movement of anatomic structures, the state of tonic and phasic activation of muscle in the lumen wall, coordination of muscle activity and resistance to bolus passage (intrabolar pressure) from high-resolution manometry. To obtain an accurate measure, we need to know the subjects anatomy, account for recording fidelity, detect apparatus-induced artifacts, recognise extraneous pressure phenomena, adjust for environmental effects, and compare to normative data. Extrinsic factors affecting recorded pressure include swallowed bolus volume, level of alertness/stress, and downstream pressure phenomena.

Professor Massey reported a number of limitations of available normative data sourcing including small sample size, 'convenience' sample drawn from a limited/poorly described population, limited age range, data from single institutions, and incompletely described study protocols. He stated that manometry does not equate to diagnosis. Manometry is an adjunct to support a differential diagnosis. Indications for manometry include to locate the UES relative to other structures, assess basal UES tone, assess deglutitive relaxation of UES, compare timing of deglutitive UES relaxation to that of other events, and to assess intrabolar pressure within the E-P segment. The advantages of HRM include lack of stimulation (aspiration), reference to atmospheric pressure (can change positions), adequate frequency response, and you can use 'live' recordings to facilitate/confirm successful intubation. The disadvantages of HRM include the catheters (they are expensive and fragile), the risk of damage with endoscopic placement, lack of channel for guidewire and archiving and backup is critical.

Impedance is the opposition to the passage of an alternating current through an electrical circuit when voltage is applied. Impedance is used as a measure of bolus transport. Professor Massey stated the working assumptions to include 1) orderly bolus entrance and exit through a region causes orderly fall then rise in impedance value, 2) the times of entrance and exit over several segments allows calculation of the velocity of the bolus head and tail, and 3) persistent low impedance suggests failed bolus clearance at that level. He reported the advantages of impedance to include no radiation exposure, it is relatively

portable, it is not dependent on patient positioning, and it is easily combined with manometric assessment. The disadvantages are it requires manometric, fluoroscopic or endoscopic guidance to position, it requires a bolus that produces a detectable change in impedance and it assesses change over a region (1cm) and not a point. Also, Professor Massey noted that once some bolus fails to clear it is difficult to assess what happens with subsequent boluses, it cannot quantitate bolus clearance and complete bolus clearance does not equate to normal clearance.

Professor Massey noted that in terms of the clinical utility of impedance, there are very limited normal and abnormal study sizes and there is a limited spectrum of boluses studied to date. He stated concurrent manometry and impedance has more potential. It is easy to employ on a single catheter platform, it can be done at the bedside, and may allow for bedside identification of aspiration risk for thin liquids. It predicts aspiration, it does not show it. Current studies are best viewed as qualitative findings right now. Procedures are non-standardised and the normative data is limited. It is operator dependent.

Omari and colleagues reported on 'An automated impedance manometry (AIM) based method to detect pharyngeal post-swallow residual'. The authors derived 'the bolus flow nadir impedance to impedance ratio ( $Z_n/Z$  ratio) from AIM. The  $Z_n/Z$  ratio during the immediate post-swallow period was compared with fluoroscopy based assessment of post-swallow residual. The authors concluded that the  $Z_n/Z$  integral may have potential as an easily determined objective marker of clinically relevant post swallow residue in patients with dysphagia.

Omari and colleagues also presented research entitled 'Upper oesophageal sphincter impedance during bolus swallowing correlates with sphincter diameter'. The authors reported that measurement of the UES diameter during bolus swallowing has clinical relevance. They stated that theoretically luminal impedance during bolus flow is influenced by luminal diameter. They measured UES nadir impedance and assessed it as a potential correlate of UES diameter. The sample size included 48 controls and patients and bolus swallowing was recorded with manometry, impedance and videofluoroscopy. The authors concluded that the UES nadir impedance correlates with the diameter of the UES during bolus flow and may have clinical utility for diagnosing UES obstruction.

O'Rourke and colleagues presented on 'Assessment of pharyngeal and oesophageal physiology during swallowing manoeuvres with high resolution manometry'. The purpose of the study was to examine pharyngeal and oesophageal physiology with high resolution manometry (HRM) in normal volunteers performing the Mendelsohn and effortful swallowing manoeuvres. Eight normal adult volunteers underwent HRM and completed dry and 5ml water bolus swallows while performing the Mendelsohn manoeuvre and effortful swallowing. Subjects were trained prior to the study day and submental electromyography was used for biofeedback. Each swallow strategy was



compared to the subjects' normal swallows. The authors concluded while both the Mendelsohn and effortful swallowing resulted in pharyngeal changes, only the Mendelsohn manoeuvre altered oesophageal physiology. A larger sample size, more swallow trials and the addition of impedance was recommended for future studies.

Ledl and colleagues presented on 'Manometric comparison of normal and dysphagic swallowing: changes in pharyngeal phase'. The purpose of this study was to compare pharyngo-oesophageal pressure generation and its timing in normals versus dysphagic patients after unilateral supratentorial stroke. Manometric measurements were performed in six dysphagic patients after unilateral hemispheric stroke compared to normative data of age matched controls.

Dysphagic subjects showed a highly significant reduction in pressure amplitude in the oro- and hypopharynx combined with an increased duration of pressure generation. Resting pressure of the UES was lower when compared to normals. Onset of pressure and onset of UES relaxation took place significantly earlier. The authors concluded that supratentorial lesions cause changes in the pharyngeal phase. The effectiveness of the pharyngeal wave in dysphagic patients is impaired by diminished pharyngeal pressure and by anticipated onset of lower pharyngeal pressure and UES relaxation. Timing differences point to a structural reorganisation in swallowing after supratentorial lesions and therefore to a (sub)cortical involvement in pharyngeal phase motor control. The authors noted that these results need to be validated in a greater population.

#### **Additional studies of interest:**

Other studies which stood out were Dr. Steven Leder's presentation on: *Does an Oral Mechanism Examination Predict Aspiration Status?* Dr Leder highlighted the lack of research to support oral mech exams despite them being routine practice in dysphagia assessments. His study with over 4,000 participants reported that labial closure and lingual range of motion to predict subsequent aspiration events was confirmed and facial symmetry was not associated with subsequent aspiration.

Stacey Skoretz won the new investigators award for her research on: *Incidence of Oropharyngeal Dysphagia and Associated Risk Factors Following Cardiovascular Surgery*, which is the first study to derive varying dysphagia frequencies across all intubation durations further identifying patients at greatest dysphagia risk. Across the entire sample, dysphagia frequency was 5.6% (51/909); but varied by intubation duration: group 1 (<12h) – 1%, group 2 (>12 to <24h) – 8.2%, group 3 (>24 to <48h) – 16.7% and group 4 (>48h) – 67.5%.

If anyone would like further information on any of the presentations or would like copies of the abstracts they can contact the below email addresses. The DRS held an excellent annual meeting in Toronto this March with world renowned

researchers exploring and expanding our knowledge of dysphagia. Attending the DRS is an excellent opportunity and comes highly recommend to SLT's working in dysphagia, especially therapists who are interested in research or who are currently undertaking further research programmes in dysphagia.

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