

## Comparison of non-invasive methodologies to assess mouth opening following lipotransfer techniques to reverse oral fibrosis

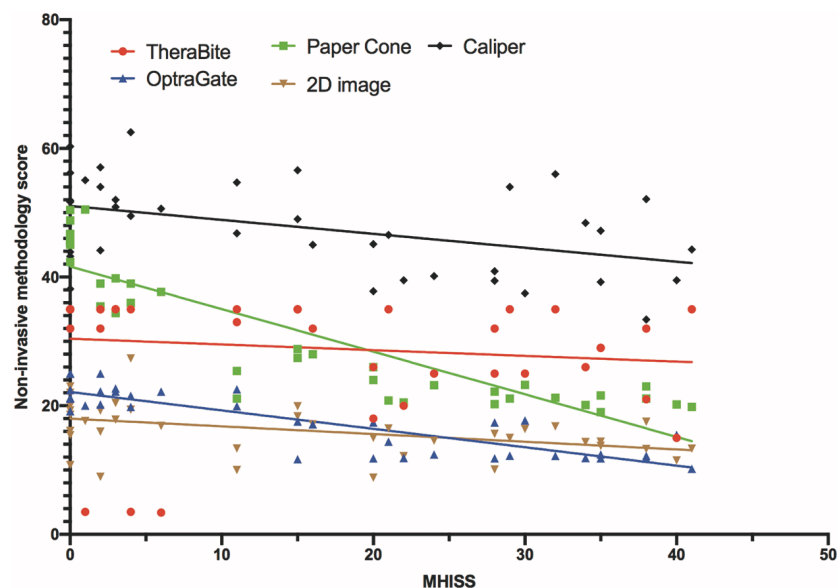
Sirs,

Systemic sclerosis is a connective tissue disease characterised by fibrosis of the skin and internal organs; the face is frequently involved in this condition and the restrictions to the mouth cause severe impairments to the patient's self-image and quality of life (1). In addition, the fibrosis causes a huge strain on the patient's oral health-related quality of life, hindering their eating, fatigue when chewing and difficulty in speaking (2). We have recently identified in a cohort of 62 patients that lipotransfer can reverse the fibrosis around the mouth (3). However, monitoring the effect of the surgical intervention is limited due to the limited tools to assess mouth opening in patients with scleroderma. The currently available method is the mouth handicap in systemic sclerosis (MHSS) score (3). However, such questionnaires can be time consuming and thus we aimed to examine whether there are alternatives method by which to assess mouth opening to monitor facial fibrosis.

Alternative techniques that have been reported for measuring mouth opening include performing two-dimensional photographs and measuring the maximum mouth opening length using software analysis tools. Alternatively, at the time of maximum mouth opening the distance can be measured using vernier's callipers (1). A paper cone, can be inserted into the mouth at the time of maximum mouth opening and the maximum point at which the patients reaches is recorded (4). Furthermore, TheraBite® jaw systems are available which is a handheld unit which has two levers, which can be placed into the mouth at time of maximum mouth opening and measured for a recording (5). Lastly, OptraGate is a latex lip and cheek retractor that allows the patient to open the mouth, whilst the clinician measures the maximum mouth opening (6).

To evaluate the tools for our intervention for facial fibrosis we examined the tools within a cohort of 20 patients with diffuse scleroderma and 20 age- and sex-matched controls. We compared the regression of each tool to the MHSS score for both control and intervention patients. Furthermore, we assessed whether any of the tools could detect differences with the control and scleroderma patients.

Analysis demonstrated that the tools had varied association to the MHSS score (Fig. 1). The highest correlation to the MHSS score was the paper cone measurement and the OptraGate system with the least being the TheraBite® system (paper



**Fig. 1.** Correlation of mouth opening tools in the 40 patients within the cohort with the mouth handicap in systemic sclerosis (MHSS) score. The highest correlation was for the OptraGate and the paper cone measurement with the MHSS score.

cone,  $R^2$  0.78, OptraGate system  $R^2$  0.75, TheraBite® 0.01, 2D imaging  $R^2$  0.19 and calipers 0.20) (Fig. 1). In addition, the OptraGate and the paper cone detected significant difference between the control and scleroderma patients ( $p < 0.001$ ). Feedback from the 40 patients within the cohort demonstrated that of all the systems evaluated the paper cone was the easiest to understand and most comfortable for assessment with the least being the TheraBite® analysis tool ( $p < 0.05$ ). Furthermore, the paper cone is significantly cheaper than the OptraGate system ( $p < 0.05$ ), which is highly important for the clinician and institution when considering evaluation tools for implementation.

The paper cone and the OptraGate systems may be the most useful for patients with facial scleroderma as these systems allow the patient to maximally open their mouth and keep it open, overcoming the problem with fatigue which is observed in these patients (1). As the paper cone is cheap and easy to implement, it offers easier translation to clinical practice.

In conclusion, using a paper cone is of value to measuring the effect of lipotransfer for scleroderma patients for improvement of the mouth opening score in addition to the MHSS score. Assessment using a paper cone is easy to implement for both the clinician and patient and may provide an additional tool to monitoring facial fibrosis in scleroderma.

M.F. GRIFFIN<sup>1,3</sup>, MBChB, MSc, MRes, MRCS, PhD  
F.H.K. JEON<sup>1,3</sup>, MBBS, MSc  
B.J.W. CHEW<sup>1,2</sup>, MBChB  
A. BAKIR<sup>2,3</sup>, MB BCh (Hons.), MSc, MRCS  
C.P. DENTON<sup>4</sup>, PhD, FRCP  
P.E.M. BUTLER<sup>1,3</sup>, MD, FRCSI, FRCS, FRCS (Plast)

<sup>1</sup>UCL Centre for Nanotechnology and Regenerative Medicine, Division of Surgery & Interventional Science, University College London;

<sup>2</sup>Department of Plastic Surgery, Royal Free London NHS Foundation Trust Hospital;

<sup>3</sup>Charles Wolfson Centre for Plastic & Reconstructive Surgery, Royal Free London NHS Foundation Trust Hospital, London;

<sup>4</sup>Centre for Rheumatology and Connective Tissue Diseases, Royal Free Hospital, London, UK.

Please address correspondence to:

Michelle Griffin,  
Division of Surgery and Interventional Science, Royal Free Hospital,  
Pond Street,  
London NW3 2QG, United Kingdom.  
E-mail: 12michellegriffin@gmail.com

Competing interests: none declared.

© Copyright CLINICAL AND EXPERIMENTAL RHEUMATOLOGY 2020.

## References

- MADDALI BONGI S, DEL ROSSO A, MINIATI I *et al.*: The Italian version of the Mouth Handicap in Systemic Sclerosis scale (MHSS) is valid, reliable and useful in assessing oral health-related quality of life (OHRQoL) in systemic sclerosis (SSc) patients. *Rheumatol Int* 2012; 32: 2785-90.
- GHEISARI M, AHMADZADEH A, NOBARI N, RANMANESH B, MOZAFARI N: Autologous Fat Grafting in the treatment of facial scleroderma. *Dermatol Res Pract* 2018; 2018: 6568016.
- BARSOTTI S, ORLANDI M, CODULLO V *et al.*: One year in review 2019: Systemic Sclerosis. *Clin Exp Rheumatol* 2019; 37 (Suppl. 119): S3-14.
- ALMADORI A, GRIFFIN M, RYAN CM *et al.*: Stem cell enriched lipotransfer reverses the effects of fibrosis in systemic sclerosis. *PLoS One* 2019; 14: e021806.
- SAUND DS, PEARSON D, DIETRICH T: Reliability and validity of self-assessment of mouth opening: a validation study. *BMC Oral Health* 2012; 12: 48.
- SCHOLEY J: OptraGate oral retractor. *J Orthod* 2009; 36: 190-3.