The Journal of Laryngology & Otology (2018), ***132***, *327–328*.

doi:10.1017/S0022215118000257

MAIN ARTICLE

Good correlation between visual analogue scale and numerical rating scale in the assessment of nasal obstruction

R HAYE[1,2], L K DØSEN[1], M TARANGEN[3], O SHIRYAEVA[3]

Departments of [1]Otorhinolaryngology, [3]Quality, Lovisenberg Diakonale Hospital, Oslo, and [2]Faculty of Medicine, University of Oslo, Norway

Abstract

Objective: Results from telephone interviews may be needed to supplement those from mailed questionnaires when response rates are inadequate. This study assessed the correlation between visual analogue scale ratings used in mailed questionnaires and numerical rating scale scores used in telephone interviews.

Methods: Patients scheduled for nasal septal surgery routinely respond to a visual analogue scale of obstruction during the day and at night. In this study, they were also asked to verbally rate their sense of obstruction using whole numbers.

Results: There was no significant difference between visual analogue scale and numerical rating scale obstruction scores.

Conclusion: Ratings of nasal obstruction obtained with a numerical rating scale in telephone interviews are comparable to visual analogue scale scores in mailed questionnaires.

Key words: Nasal Obstruction; Outcome Measures; Visual Analogue Scale

Introduction

Quality control of nasal septal surgery can be assessed with mailed questionnaires, and several studies have reported using a visual analogue scale (VAS) to rate nasal obstruction.[1] In studies with low response rates, telephone interviews may be used to supplement insufficient data. In telephone interviews, ratings are given verbally using a numerical rating scale. Before incorporating obstruction scores from interviews with mailed questionnaire responses, it is necessary to know whether the two scales are comparable. We, therefore, initiated a study comparing VAS scores and numerical rating scale ratings of nasal obstruction.

Materials and methods

This study was approved by the Ethics Committee of Lovisenberg Diakonale Hospital.

Patients scheduled for nasal septal surgery in our department complete the Nasal Surgical Questionnaire,[2] which contains separate VASs for nasal obstruction during the day and at night. The scale is 10 cm long, and marked 'Open' at the left end and 'Blocked' at the right end. The patients are asked to rate their sense of obstruction with a mark on the scales. The response is measured in millimetres from the left end. The scale ranges from 0 to 100. The questionnaire also includes four-point Likert scales for other nasal symptoms and use of nasal medication, but these are not relevant for this study.

All patients from December 2016 to February 2017 responded to the Nasal Surgical Questionnaire and delivered it to the surgical reception desk prior to surgery.

Patients were then asked to numerically rate their sense of obstruction during the day and at night, on a scale from 0 to 10, with 0 representing 'open' and 10 indicating 'totally blocked'. They were not permitted to see their prior paper scorings. A patient would sometimes present two numbers indicating that the score was somewhere in-between. We registered the result as the mean of the two numbers. For ease of comparison, the numbers were multiplied by 10, with the scale extending from 0 to 100.

Statistical analyses

Continuous data are presented as means and standard deviations (SDs), and categorical variables as frequencies. The Wilcoxon signed rank test was used to estimate the difference in responses between the VAS and numerical rating scale items for nasal obstruction

Accepted for publication 18 November 2017 First published online 15 February 2018

TABLE I
NASAL OBSTRUCTION SCORES

Time	VAS	Numerical rating scale	Difference	*p*
Day*	64.3 (21.6)	65.1 (20.8)	5.4 (4.9)	0.21
Night†	76.3 (17.5)	75.9 (17.7)	4.8 (3.9)	0.58

Data represent mean scores (standard deviations). *$n = 114$; †$n = 112$. VAS = visual analogue scale

during the day and night. Spearmen correlation coefficients were used to estimate associations between VAS and numerical rating scale scores. Data were analysed with SPSS statistical software (version 24.0 for Windows; IBM, Armonk, New York, USA). All tests were two-sided, and p values of less than 0.05 were considered statistically significant.

Results

A total of 114 patients, 76 males and 41 females, with a mean age of 34.3 years, responded to both the VAS and the numerical rating scale of obstruction. The mean scores and the differences between them are shown in Table I.

There were no significant differences between the ratings from the two scales, either during the day or at night. A pairwise comparison of the VAS and numerical rating scale scores showed a good correlation between them (Spearman correlation coefficient = 0.93, $p < 0.001$). The same finding was also observed for the night scores ($r = 0.89$, $p < 0.001$).

Discussion

In this study, the mean nasal obstruction scores during the day and at night were very similar in both the VAS and the numerical rating scale. We have not been able to find any published study of nasal obstruction in which these two scales have been compared.

Studies of pain intensity use different rating scales, the most common of which are the VAS, numerical rating scale and verbal rating scale. Hjermstad *et al.* reviewed 54 acceptable articles comparing these scales.[3] They found that the majority of the papers reported relatively consistent findings with respect to the correlation between them, particularly so between the VAS and numerical rating scale. Although these studies relate to an item other than nasal obstruction, we find that they lend credence to our findings.

The mean difference between the VAS and numerical rating scale scores was 5.4 during the day and 4.8 at night. In an earlier study,[4] we found that the mean difference (±SD) between two separate VAS recordings was 7.7 (±5.7) during the day and 6.9 (±5.8) at night. This suggests that the difference between the VAS and numerical rating scale recordings are comparable to the difference between two VAS recordings taken some time apart. In a study comparing a VAS to a numerical rating scale[5] of pain intensity, the mean difference in scores between them was only slightly larger than that between two VAS recordings taken 1 minute apart, suggesting that the numerical rating scale is as reliable an approximation of VAS as a repeat VAS. This supports the similar findings in our study.

- **Surgical results are often obtained via mailed questionnaires using visual analogue scales (VASs)**
- **Telephone interviews using numerical rating scales may be necessary to supplement data**
- **The VAS and numerical rating scale scores are highly correlated**
- **This suggests that telephone interview responses are comparable to those from mailed questionnaires**

A direct mathematical equivalence could not be expected as the VAS is an uninterrupted scale and the numerical rating scale is an interrupted scale, and the presentation modes are different. However, the mean scores are very close, with correlations between them, suggesting that the two scales are comparable. We anticipate further studies comparing the VAS and numerical rating scale, as the numerical rating scale may be easier to implement in electronic questionnaires.

Acknowledgement

This study was financially supported by Lovisenberg Diakonale Hospital.

References

1 Rhee JS, Sullivan CD, Frank DO, Kimbell JS, Garcia GJ. A systematic review of patient-reported nasal obstruction scores defining normative and symptomatic ranges in surgical patients. *JAMA Facial Plast Surg* 2014;**16**:219–25.
2 Haye R, Amlie E, Shireyaeva O, Døsen LK. Evaluation of a nasal surgical questionnaire designed for monitoring surgical outcomes and comparing different surgical techniques. *J Laryngol Otol* 2015;**129**:656–61.
3 Hjermstad MJ, Fayers PM, Haugen DF, Caraceni A, Hanks GW, Loge JH *et al.* Studies comparing numerical rating scales, verbal rating scales and visual analogue scales for assessment of pain intensity in adults: a systematic literature review. *J Pain Symptom Manage* 2011;**41**:1073–93.
4 Haye R, Tarangen M, Shiryaeva O, Døsen LK. Evaluation of the Nasal Surgical Questionnaire for monitoring results of septoplasty. *Int J Otolaryngol* 2015;**2015**:563639.
5 Bijur PE, Latimer CT, Gallagher EJ. Validation of a verbally administered rating scale of acute pain for use in the emergency department. *Acad Emerg Med* 2003;**10**:390–2.

Address for correspondence:
Dr Rolf Haye,
Department of Otolaryngology,
Lovisenberg Diakonale Hospital,
Oslo, Norway

Fax: +47 2204 1002
E-mail: rolf.haye@medisin.uio.no

Dr R Haye takes responsibility for the integrity of the content of the paper
Competing interests: None declared

https://doi.org/10.1017/S0022215118000257 Published online by Cambridge University Press