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Validity and Reliability of Full Cup Test in Pain Evaluation after Dental Surgery: A Comparison with Four Pain-Rating Scales in a Sample of Iraqi Patients

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Abstract

Objectives: Pain assessment by clinicians can be difficult as it is subjective and depends on the patient's self-report. The aims of this study were to evaluate the validity and reliability of a pain-rating scale; the full cup test (FCT), and to compare its performance to other scales in assessing pain following dental surgery. The ease of using these pain scales were compared.

Study design: Forty-three patients who have had different dental surgeries were included. All patients asked to complete five pain scales: Faces pain scale, numeric rating scale, visual analog scale, verbal rating scale, and FCT for seven consecutive days starting on the day of the surgery. The analysis of variance (One-way ANOVA test), correlation between different scales (Pearson correlation), and reliability (Cronbach alpha) of FCT were evaluated.

Results: The scales correlated highly with each other ($P < 0.001$). The FCT was highly reliable (Cronbach's Alpha = .970) and was found to be the easiest scale to use.

Conclusion: The FCT is valid, reliable and relatively easy to use pain scale in this group of patients. It can be used to assess pain intensity interchangeably with other pain rating scales.

Introduction

Surgical operations are common procedures in dental practice. They can be uncomfortable for patients and usually cause postoperative pain. The assessment of perceived pain helps in the selection of the appropriate therapeutic regimen and for the evaluation of treatment efficacy (Lund and Lundebor, 2006). The multidimensional scales provide more information about the characteristics of the pain and associated disability in addition to the assessment of sensory, affective and evaluative dimensions of pain but they are more difficult to complete by patients. The one-dimensional scales, which measure the pain severity and change in intensity, are easier to complete and are used regularly in pain research (Briggs and Closs, 1999).

Among several subjective pain intensity measurement scales, the visual analogue scales (VAS), numerical rating scales (NRS), and verbal rating scales (VRS) are the most commonly used and have proved to be reliable and valid (Pagé et al., 2011; Ferreira-Valente et al. 2011; Isik et al., 2011; Brunelli et al. 2010).

The less popular pain rating scale is the faces pain scales (FPS), which is the preferred method by children and therefore mainly used to assess pain severity in this group (Keck et al. 1996; Garra et al., 2010a). In 2007, a new self-reported pain evaluation scale; full cup test (FCT), was suggested by Ergün et al., as a method of pain assessment especially useful in patients with low education (Ergun et al 2007).

In the absence of a gold standard for pain assessment, clinicians have a choice of systems to use. It is therefore important that pain rating systems are assessed and compared for interchangeability (Lund, 2005).

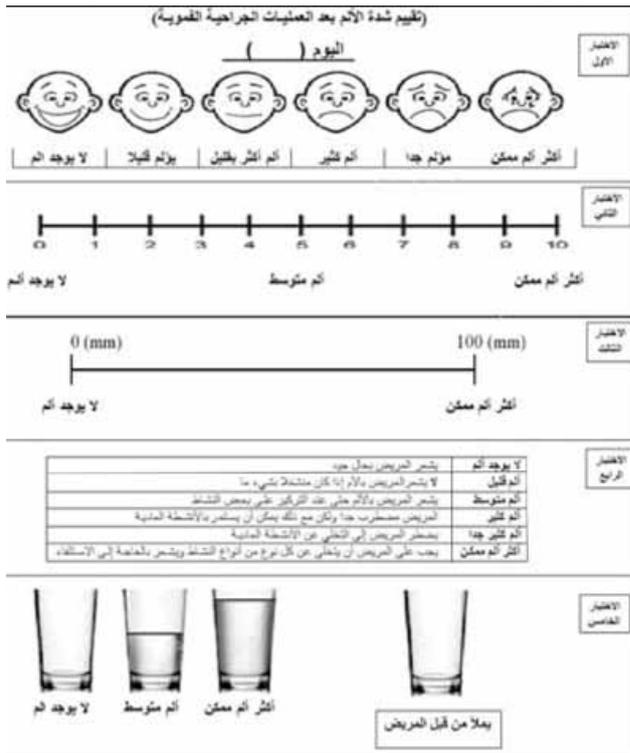
The primary purpose of the current study was to evaluate the validity and reliability of the FCT in Iraqi patients after dental surgery using intra-individual assessments of self-reported pain intensity scales. The secondary purpose was to find out which of the tested pain rating scales is easiest to use.

Materials and methods

The study was approved by the ethical committee of the Ministry of Health, IRAQ and conducted at the Department of the Oral Surgery, The Left Specialized Dental Center, Mosul City.

Inclusion criteria: Patients undergoing any dental surgery including flap reflection and bone removal. Exclusion criteria: Cognitive or mental disability, illiterate patients who are not accompanied by an advocate, and patients who refuse to participate.

Forty-nine patients expressed an interest to participate and all of them provided written informed consent. The scales tested included the VAS, the NRS, VRS, FPS and FCT. Arabic translation of the scales was performed (Fig.1) and the patients were fully informed about the scales before surgery.



◀ Fig [1]: Arabic translation of pain scales

The VAS consists of a horizontal line 100 mm in length, with the ends 'no pain' and 'worst pain imaginable' placed at each end of the line. Patients asked to make a mark on the line that best represents the intensity of their pain. The NRS is an 11-point scale consisting of integers from 0 to 10; 0 representing 'no pain' and 10 representing 'worst pain imaginable' Patients were asked to select a single number that best represents their pain intensity.

The VRS is a 6-point scale consisting of a list of phrases; no pain, mild pain, moderate pain, severe pain, very severe pain, and worst pain imaginable. Patients were asked to select a single phrase that best characterized their pain intensity. Each phrase corresponds to a numeric score (0, 2, 4, 6, 8, or 10).

The FPS is a 6-point scale, with 6 different faces that represent increasing levels of pain intensity. Patients were asked to select one expression that best characterized their pain intensity, from 'no pain' (face placed to the extreme left), to 'worst pain imaginable' (face placed to the extreme right). Each illustration corresponds to a numeric score (0, 2, 4, 6, 8, or 10). For the FCT, a drawing of a cup was used. The patients were told 'this cup is completely empty when there is no pain and completely full when your pain is the worst imaginable intensity. The patients were asked to draw a horizontal line on the cup to correspond to level of experienced pain. The FCT score was calculated as follows: height of line/ height of cup × 10. All surgeries were performed under local anesthesia. After surgery, patients were given forms of the different pain scales to be filled daily for the day of the surgery and six postoperative days in addition to the day of surgery. The patients were asked to mark all the above pain scales daily starting on the day of the surgery and for 6 days afterwards. Patients handed in the pain rating forms when they attended for suture removal and for examination of the surgical wound, seven days postoperatively. Finally, the patients were asked to determine which scale is the easiest to use. The data was analyzed using IBM SPSS Statistic 23 (SPSS Inc., Chicago, IL, USA). Analysis of variance (One-way ANOVA test), correlation (Pearson correlation), and reliability (Cronbach alpha) were evaluated. The patients' easiest-to-use scale was also assessed (Chi-square test).

Results

Of the forty-nine patients who expressed an interest to participate, forty-three returned the forms. Seventeen were males (39.53 %) and twenty-six were females (60.47%). The age of the patients ranged from 9-55 years old (M=26.95, SD=12.306).

Nine patients (20.93%) did not know how to use certain scale/scales to rate their pain. However, all patients successfully used the FPS as it was better understood.

In addition, when patients asked about the easiest to use scale, a significantly higher proportion of patients preferred the FPS (P < 0.001) (Table 1).

	FPS	NRS	VAS	VRS	FCT	No choice	Sig.
Easiest scale (N=43)	16 (37.2%)	1 (2.3%)	1 (2.3%)	2 (4.6%)	3 (6.9%)	20 (46.5%)	.000*

Table (1): Patients' easiest-to-use scales

Analysis of variance revealed no significant difference existed among scales (P < 0.978;). The scales were very highly correlated (P < 0.001; Fig.2; Table 2) and FCT was highly reliable (Cronbach's Alpha= .970).

Table (2) Pearson correlation among scales

	FPS	NRS	VAS	VRS	FCT
FPS	1	.997**	.993**	.989**	.996**
NRS	.997**	1	.995**	.995**	.999**
VAS	.993**	.995**	1	.995**	.993**
VRS	.989**	.995**	.995**	1	.992**
FCT	.996**	.999**	.993**	.992**	1

** Correlation is significant at the 0.01 level (2-tailed).

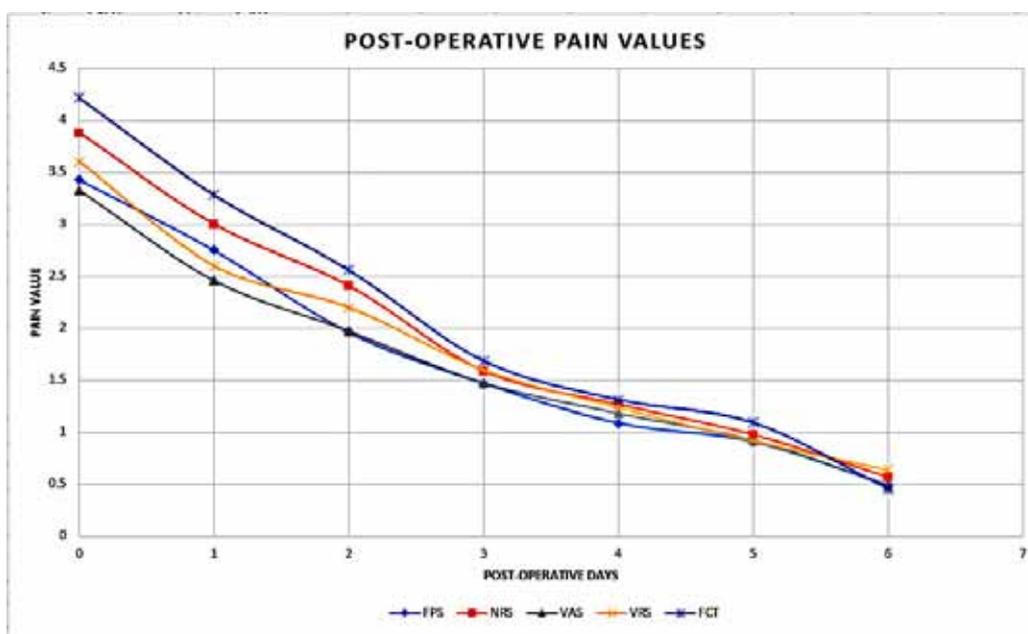


Fig [2]:
Post-operative pain values as recorded by scales.

DISCUSSION

It is reported that a pain scale should be easy to understand, clinically relevant, and closely related to the response of the patient (Dionne et al., 2005). Simple pain measurement is an important criterion for choosing between rating scales (Breivik et al., 2000).

Our study data support that FPS is better understood and easier to use in comparison with other pain scales.

The FCT is a newer pain self-assessment tool, claiming to be valuable in patients with low education (Lund et al., 2005). It has the advantages of VAS without its practical difficulties and the data obtained from FCT can be used for parametric tests (Isik et al., 2011). However, this study found that the FCT is the most “non-understood” scale among other scales. This might be due to difficulty in imagining how pain can fill a cup. These findings disagreed with Isik et al. (2011).

Although these scales have been evaluated in many populations (Odai et al., 2015; Ferreira-Valente et al., 2011; Isik et al., 2011), the validity of these scales, to the authors’ best knowledge, have not been tested on Iraqi population. Evaluations of common pain measures in populations from different countries can help establish the cross-cultural applicability of the scale and the validity of the findings (Ferreira-Valente et al., 2011).

Patients in this study reported that the FPS is the easiest pain assessment scale to use followed by FCT, VRS, NRS and VAS. The results were in agreement with Breivik et al. (2000) although the FPS and the FCT were not included in their study. We demonstrated that patients prefer the VRS or NRS to VAS for the sake of simplicity. In addition, Isik et al. (2011) reported comparable results where they reported that the VRS followed by the then FCT were easier to use compared with the VAS.

Many pain-rating scales are available, each have its own advantages, and disadvantage. VAS is the most commonly used scale for rating pain intensity in research. It allows for a wide choice of ratings and avoid imprecise descriptive terms (Scott and McDonald, 2008). The main benefit of the VAS over other scales is that the data are continuous, normally distributed, and it can provide data for parametric analysis (Philip, 1990). However, it requires the patient to be able to equate the length of the line with the amount of pain they are experiencing (Briggs, 1999) and needs more concentration (Cook, 1999). In our study, some of patients (13.9%) did not know how to use the VAS.

The NRS is simple, quick, and widely used (Hartrick et al., 2003), and its scores are suitable for parametric analysis (Dijkers, 2010; Williamson and Hoggart, 2005). Some patients have difficulty representing their pain in numerical terms and are better suited to a categorical scale (Hartrick et al., 2003). This might explain why some patients in this study (6.9%) ignored this scale.

Study participants response for the VRS was better than that for the NRS. The VRS is an ordinal scale, which have the advantage of being quick and simple and may be useful in the elderly, the visually impaired patients and in some children. However, the limited number of choices in categorical compared with numerical scales may make it more difficult to detect differences in response to treatments when compared with VAS and NRS (Breivik, 2000). In addition to the personal or linguistic limitations in interpretation of the description words (Macintyre et al. 2010). This could be the cause behind inability of 4.6% of our patients not completing the VRS.

FPS was the only scale that was used successfully by all patients, which indicates its easiness. Numerous face-based rating scales are available (Chambers et al., 1999). The Wong-Baker faces pain-rating scale (WBFPS) is one of these faces scales that has been used in research (Garra et al., 2013; Khatri and Kalra, 2012; Garra et al. 2010b). The FPS has been developed for use with children (Keck, 1996; Garra et al. 2010b) and proven to be useful with people with cognitive and communication disabilities (Ferreira-Valente et al, 2011). Our findings support its validity in adults and were consistent with the results of a study published by Kim et al. (2006). In our study the FPS was the only scales that was used successfully by all patients, which indicates that patients found it easy to understand and to use.

The study findings support the validity of FCT along with other four scales studied for detecting pain intensity in Iraqi patients. These results with the results of previously published studies support each scale’s validity (Ferreira-Valente et al., 2011; Price et al., 2008; Kim and Buschmann, 2006; Jensen, 2003; Breivik et al., 2000). It also supports the reliability of the FCT when compared with the VAS, the most commonly used scale for research (Scott and McDonald, 2008).

Conclusion

Our results indicate that the FCT is a valid and a reliable scale for detecting pain intensity following different oral surgical operations in Iraqi patients. The FPS was found to be the easiest pain scale to use by our patients in comparison with the other four pain rating scales tested. The second easiest pain scale to use was the FCT followed by the VRS, the NRS and the VAS.

Conflict of interest: None

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