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LETTER

Sensitivity and specificity of Critical Care Pain Observation Tool used for intubated patients following open-heart surgery

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Pain is one of the most frequent/stressful symptoms reported by ICU patients [1]. Self-reporting is considered as the gold standard in the assessment of pain, and the priority for pain assessment is to have patients evaluate their pain themselves; therefore, the evaluation of pain in patients who are unable to communicate is a challenge for clinicians [2, 3].

The Critical Care Pain Observation Tool (CPOT) is a behavioral pain assessment tool for uncommunicative and sedated ICU patients [2]. The CPOT cutoff score >2, for the presence of pain, was empirically determined using ROC curve analysis in communicative critical ill patients. CPOT consists of four domains, namely facial expression, body movements, muscle tension, and compliance with the ventilation for intubated patients or vocalization for patients without endotracheal tube; the total score ranges from 0 (no pain) to 8 (maximum pain) [4].

Although CPOT has been shown to be a valid tool for detection of pain in various ICU patients, its use has not yet been validated in patients undergoing open-heart surgery. The goal of this study was to determine the sensitivity and specificity of CPOT in assessing the level of pain in intubated patients following open-heart surgery. This repeated-measure design study was conducted on 150 ICU patients following open-heart surgery in Heshmat Hospital in northern Iran (Guilan, Rasht), after gaining approval from the Ethics Committee for Research and Technology of Guilan University of Medical Sciences.

After admission, participants were taught about visual analogue scale (VAS) and CPOT tools. Each patient was assessed with CPOT and VAS before, during, and 20 min after a suction procedure, which was considered a painful stimulus.

More than 90 % of samples scored zero on behavioral changes before and after suction. The maximum behavioral changes were related to facial expression during suction. Most patients (56 %) obtained scores of 2 on CPOT. Spearman correlation coefficient revealed a significant correlation between VAS and CPOT (before: $r = 0.34$, $p < 0.0001$; during: $r = 0.11$, $p < 0.17$; after: $r = 0.281$, $p < 0.0001$) (Fig. 1).

The results indicated the sensitivity and specificity prior to suction (38 and 90 %), during suction (75 and 40 %), and after suction (32 and 92 %). ROC curve analysis indicated that the areas under the curves for predicting the level of CPOT corresponding to each step of VAS with a cutoff point of 6 were significantly more than 50 % (presuction, ROC = 0.606; during suction, ROC = 0.622; after suction, ROC = 0.675). Therefore, the best cutoff score for a CPOT of 1 affords a sensitivity and specificity of 38.2 and 90.5 % before suction and 32.8 and 92.2 % after suction, respectively.

As VAS and CPOT have different distinctive features (sensory and behavioral basis), we recommend simultaneous application of both tools to determine the existence and severity of pain. The study provides support to the use of CPOT as a valuable option to assess painful procedures evoked by suctioning in patients in ICU. It is

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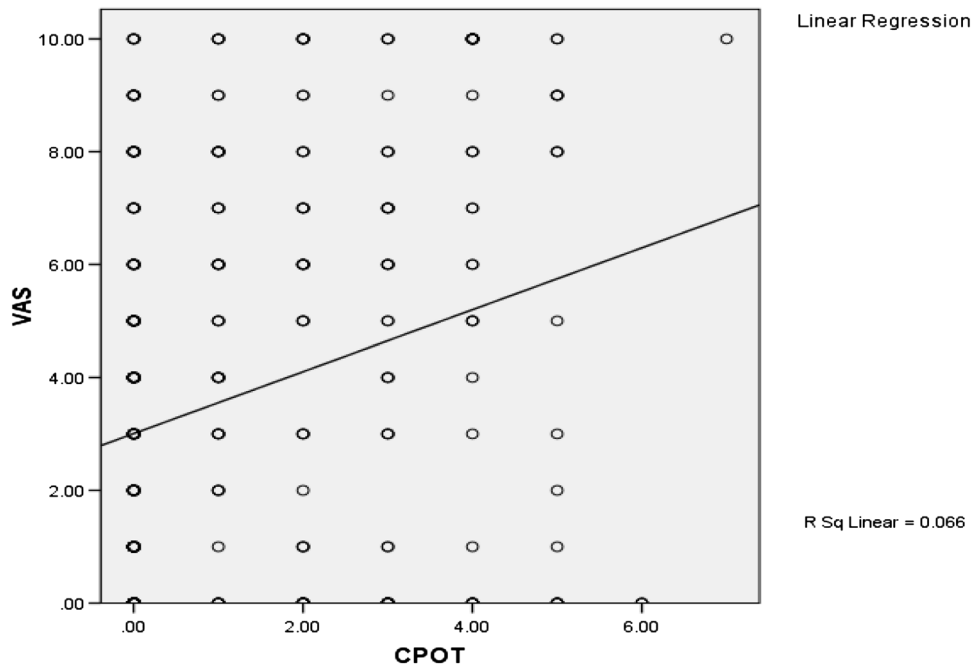

Fig. 1 Correlation between VAS and CPOT

suggested that the agreement of CPOT and the VAS be further explored in different critically ill populations and various situations or procedures.

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Compliance with ethical standards

Conflicts of interest
The authors declare that they have no conflict of interest.

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