COMPARISON OF CONTEMPORANEOUS AND RETROSPECTIVE ASSESSMENT OF POSTOPERATIVE PAIN USING THE VISUAL ANALOGUE SCALE

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SUMMARY

We have assessed postoperative pain in 50 patients who had undergone total abdominal hysterectomy, using repeated contemporaneous and single retrospective visual analogue scores. There were significant correlations between the median, mean and greatest contemporaneous scores, and the single retrospective scores, but there was a wide scatter of results among and within individual patients. We conclude that the wide variability between the two methods of assessment suggests that the two techniques should not be used interchangeably.

KEY WORDS

Measurement techniques: visual analogue scale, retrospective. Pain: postoperative.

The visual analogue scale (VAS) is used commonly to quantify pain in clinical investigations. However, the frequency and timing of pain assessment in the postoperative period vary considerably and are often selected empirically. For instance, pain may be assessed hourly or at specific times such as during mobilization. In the past, some investigators used a single retrospective measurement to assess the intensity of pain in the preceding 24 or 48 h [1, 2]. However, the reliability of assessing pain using this type of single retrospective assessment has not been compared with repeated contemporaneous assessment. The purpose of this study was to compare these two methods of assessment.

PATIENTS AND METHODS

We studied 50 healthy patients who had undergone total abdominal hysterectomy; all received a standard general anaesthetic. They were pre-medicated with temazepam 10–20 mg and anaesthesia was induced with thiopentone 5 mg kg\(^{-1}\) and fentanyl 1.5–2 μg kg\(^{-1}\). Tracheal intubation was facilitated with vecuronium 0.1 mg kg\(^{-1}\) and the patient's lungs were ventilated with 67% nitrous oxide and 0.5–1.5 % enfurane in oxygen. At the end of the operation, residual neuromuscular block was antagonized with neostigmine 35 μg kg\(^{-1}\) and glycopyrronium 8 μg kg\(^{-1}\). None of the patients received regional analgesia. I.m. injections of papaveretum 0.2–0.3 mg kg\(^{-1}\) were prescribed 4-hourly and administered when deemed to be required, by the nursing staff.

The principle of the visual analogue scale was explained to all patients on the day before the operation. The VAS consisted of a 100-mm line on A4 paper, with "No pain at all" printed on the extreme left of the line and "Worst possible pain" on the right. Pain was assessed by the patients every 2 h on the first day after operation from 09:00 to 21:00. As a result, there were seven pain scores for each patient on the first day. These represented the contemporaneous scores; the median, mean and the greatest value of these scores were used for subsequent analysis. A new VAS was used for each assessment and patients were unable to refer to their previous scores. At 09:00 on the second day, two further VAS were completed. The first assessed the overall pain of each patient in the preceding 24 h; this represented the single retrospective score. The second assessed the severity of the patient's current pain. The analgesic requirement during the period of assessment was also recorded.
RESULTS

The mean age (range) and weight (SD) of the patients were 42.3 (26-65) yr and 64.6 (8.1) kg, respectively. The mean (SD) dose of papaveretum administered on the first day after operation was 8.6 (3.5) mg. The distribution of the median and range of contemporaneous scores for all patients is shown in figure 1. It is clear that there was wide variability of pain scores both within and between patients.

The relationship between the single retrospective score and the median contemporaneous score is shown in figure 2. There was a significant correlation between them \( r = +0.63, \ P < 0.0001 \). Similar relationships were found between the single retrospective score and the mean contemporaneous score \( r = +0.63, \ P < 0.0001 \), and between the single retrospective score and the greatest contemporaneous score \( r = +0.66, \ P < 0.0001 \). The correlations between the single retrospective score and the smallest contemporaneous score or the contemporaneous scores at 09:00 on the second day were weaker \( r = +0.31 \) and \(+0.56\), respectively), but were also statistically significant. The Y-intercept and the slope of the regression line between the single retrospective and the various contemporaneous scores are summarized in table I.

![Fig. 1. Median (●) and range (bars) of VAS for all patients, arranged in ascending order of median values.](image)

![Fig. 2. Relationship between the median VAS score and single retrospective VAS score. The solid line represents the regression line and the interrupted lines represent the 95% confidence intervals of the regression line.](image)

![Fig. 3. Relationship between the mean of the median plus retrospective VAS (Mean scores) and the difference (retrospective minus median) between the scores (Difference). The dotted line represents the mean bias, the two interrupted lines represent the limits of agreement.](image)

**TABLE I. Relationships between single retrospective and contemporaneous (mean, median, current pain at 09:00 on second day, smallest and greatest) scores**

<table>
<thead>
<tr>
<th>VAS</th>
<th>( r )</th>
<th>( P )</th>
<th>Intercept (95% C.I.)</th>
<th>Slope (95% C.I.)</th>
<th>Residual SD</th>
<th>Mean bias (2SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.63</td>
<td>&lt; 0.0001</td>
<td>14.2 (5.5-22.9)</td>
<td>0.47 (0.25-0.69)</td>
<td>13.1</td>
<td>9.8 (35.8)</td>
</tr>
<tr>
<td>Median</td>
<td>0.63</td>
<td>&lt; 0.0001</td>
<td>11.2 (2.3-20.1)</td>
<td>0.53 (0.31-0.75)</td>
<td>14.9</td>
<td>9.9 (36.6)</td>
</tr>
<tr>
<td>09:00</td>
<td>0.56</td>
<td>&lt; 0.0001</td>
<td>3.4 (-5.1 to 11.9)</td>
<td>0.55 (0.31-0.79)</td>
<td>18.5</td>
<td>17.1 (42.4)</td>
</tr>
<tr>
<td>Smallest</td>
<td>0.31</td>
<td>&lt; 0.028</td>
<td>7.5 (2.0-13.0)</td>
<td>0.18 (-0.09 to 0.45)</td>
<td>12.4</td>
<td>29.6 (45.2)</td>
</tr>
<tr>
<td>Greatest</td>
<td>0.66</td>
<td>&lt; 0.0001</td>
<td>26.6 (13.7-39.5)</td>
<td>0.64 (0.42-0.85)</td>
<td>16.7</td>
<td>-10.2 (37.4)</td>
</tr>
</tbody>
</table>
The data were analysed also using Bland and Altman's method [3] in order to examine the agreement between the two approaches of pain assessment. The mean bias and limits of agreement are the mean and ±2SD, respectively, of the differences between two methods of measurement. In the case of the single retrospective scores and the median contemporaneous scores, the mean bias and limits of agreement were 9.9 mm and ±36.6 mm, respectively (fig. 3). The mean biases and the limits of agreement between the retrospective scores and the various contemporaneous scores are also summarized in table I.

DISCUSSION

Pain is a subjective sensation and is difficult to measure. Nevertheless, it is important to quantify it as reproducibly as possible. It has been stressed again recently that pain should be assessed routinely in the postoperative period, with other physiological variables such as arterial pressure and heart rate [4]. There is a range of methods available, but the frequency and timing of pain assessments vary considerably. Multidimensional assessment, for example the McGill pain questionnaire, has been shown to produce consistent results, but is probably too complicated to use in the immediate postoperative period. In contrast, visual analogue scales are easy to use and have been utilized widely by clinical investigators to quantify acute pain in the postoperative period. Moreover, the reliability and reproducibility of VAS have been studied extensively [5, 6].

In the past, single retrospective assessment has been used to assess acute postoperative pain [1, 2]. The potential advantages of a single retrospective assessment of overall pain are that it is less labour-intensive, more convenient to the investigators and less disruptive to the patients. It may also allow prediction of some feature of the contemporaneous scores (i.e. the mean, median, greatest or smallest). In addition, factors such as the residual effect of general anaesthetics and the sedation associated with opioid drugs, which may increase the variability of pain perception and its measurement, may be greatly reduced by using a single retrospective assessment. However, the use of a single retrospective assessment of the overall pain relief in the preceding 24 h has been criticized [7, 8]. In addition, it has been reported that patients were unable to remember severe pain in the immediate postoperative period when questioned the following day [9]. In a study [10] which examined the analgesic effect of nalbuphine, patients were reported to have severe pain and high contemporaneous pain scores, but these patients reported good or excellent overall pain relief retrospectively at the end of the study. Retrospective assessment of labour pain [11] and chronic pain [12] have been investigated; par-turients appeared to have lower retrospective scores [11], whereas patients with chronic pain tended to report higher retrospective scores [12], but the methods of analysis were different from those used in the present study. However, no formal comparison of contemporaneous and retrospective scoring has been carried out previously.

The highly significant correlations between the single retrospective scores and the median, mean and greatest contemporaneous scores were not surprising, as the contemporaneous and retrospective scores were measuring approximately the same variable. In general, patients might be expected to have a better memory of their worst pain (highest scores) than their least pain (lowest scores), as reflected by the greater correlation coefficient for the former. The correlation between the single retrospective score and the current pain score at 09:00 on the second day was relatively weak, suggesting that pain at the time of retrospective assessment may have little influence on the memory of overall pain on the previous day. However, correlation coefficient only measures the strength of relation between two variables and not the agreement of the relation between them.

According to Bland and Altman [3], it is more informative to plot the difference of the measurements by the two methods against the mean of these measurements. The mean bias represents the mean of the differences between the two scores for all patients. The limits of agreement represent 2SD of these differences from the mean bias. In this study, the single retrospective scores tended to be greater than the median contemporaneous scores by 9.9 mm (mean bias), but the limits of agreement were wide (±36.6 mm). The scatter of results is too wide for the two methods to be used interchangeably, and therefore it is probably too unreliable to predict the median contemporaneous scores from the single retrospective scores. Similar wide limits of agreement were found between the single retrospective scores and the other contemporaneous scores.

It has been suggested that analgesics with
amnesic properties might provide misleading results if studies depended on retrospective assessments [10]. In addition, the mode of administration of analgesic drugs may have an influence on the variability of pain perception, depending on the elapse of time between drug administration and pain assessment; intermittent i.m. injections may increase the variability of pain assessment in comparison with continuous infusions, patient-controlled analgesia or administration of analgesics via the extradural route. As a result of the wide scatter of data and wide limits of agreement between the retrospective and contemporaneous scores, we conclude that the two methods of acute pain assessment cannot be used interchangeably in the postoperative period when the administration of opioids is via intermittent i.m. route. The implication of this is that studies on acute pain and its management may be compared with each other only if the same method of pain measurement has been used.

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REFERENCES