Psychological status, real pain and antioxidant capacity of plasma, could make the prediction about the post-trauma wound healing

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Abstract
Patients submitted to a trauma followed by a surgical intervention, experience pain and discomfort. Exogenous (surgical intervention, anesthesia) postoperative care, and endogenous factors, belonging to patient, especially neuro-psychological disturbances are synergic and participate together, to induce and to amplify the imbalance between oxidants/antioxidants, sustaining the appearance of oxidative injury, and worsening the wound healing. The morphological aspects are not correlated with the pain expression, but the discomfort and agitation have a great influence upon the bad evolution of organism and of wound healing.

Keywords: anxiety, pain, verbal scale, antioxidant capacity of plasma, wound healing.

Introduction
Patients submitted to a trauma followed by a surgical intervention, experience pain and discomfort. Pain is associated with sympathetic hyperactivity, which is reflected in: rising of the heart rate, respiratory rate, arterial pressure, myocardial O2 consumption, a.s.o. These phenomenons increase the risk of organic multitym-function because of ischemia. Exogenous (surgical intervention, anesthesia) postoperative care, and endogenous factors, belonging to patient, especially neuro-psychological disturbances are synergic and participate together, to induce and to amplify the imbalance between oxidants/antioxidants, sustaining the appearance of oxidative injury, and worsening the wound healing.

The proportion of patients reporting pain was suggested by many authors [1, 2], but, sometimes, the patient cannot express the real pain and the surgeon could not recognize the elements necessary to elaborate the prediction about the quality of wound evolution, correlated with the psychological constitution. A multitude of literature database, present the search terms pain, measurement and care [3, 4] and many authors expose virtual instruments, namely: pain scales. There are many kind of pain scales, such as: McGill Pain Questionnaire and Short-Form McGill Pain Questionnaire – questionnaires incorporating a series of adjectives to describe the characteristics and intensity of pain. The longer version of this instrument was used by Kane RL et al. (1985) to evaluate a clinical trial of hospice care [5].

Memorial Pain Assessment Card [6] is a two-sided card that measures pain intensity and the patient’s mood on one side, and has a modified version of the Tursky Pain Description Scale on the other. Wong face scale, numerical Rating Scale, where the patient is asked to rate the pain from 0 to 10 (or 0 to 100). This measure is simple with a high rate of completion.

Pain as assessed in the Medical Outcomes Study [7] is measured in terms of severity, duration, frequency, and impact on behavior and mental well-being.

Pain Disability Index [8] is an instrument designed to measure the impact of chronic pain on various daily activities [9–11]. The instrument has been employed in a study, which examined physical and psychological morbidity after node dissection for breast cancer [12]. Pain Management Index [13, 14] compares the most potent analgesic with reported level of pain. The PMI has been employed in a study examining treatment for chronic cancer pain [15]. Pain Perception Profile [16] is an instrument measuring the affective, sensory and intensity dimensions of pain. Patient Outcome Questionnaire (American Pain Society, 1995) is questionnaire designed as part of the APS’s guidelines for pain treatment. The instrument measures pain severity, interference, satisfaction with pain control, and various aspects of pain treatment and medication. The Breakthrough Pain Questionnaire [17] – an instrument with explicit questions identifying patients with breakthrough pain. Brief Pain Inventory [14] – an assessment tool for cancer patients developed by the Pain Research Group of the WHO Collaborating Center for Symptom Evaluation and Cancer Care. The tool measures the intensity of pain and interference of pain in the patient’s life, and has been used as an outcome measure in advanced cancer patients [18].

Verbal Rating Scale – there are many forums of verbal rating scales. Visual Analogue – various authors have utilized a VAS to record various aspects of pain control. They usually are 100 mm lines with two words that anchor different end of the spectrum [e.g., pain as bad as it can be, no pain]. City of Hope Mayday Pain Resource Center Pain Audit Tools includes a chart review component, a patient interview component, and
Patients and Methods

We selected a group of study from Plastic and Reconstructive Department from the Emergency County Hospital of Craiova. The study was favorable advised, by the Ethics Commission. The group contained 70 patients (35 ± 10-year-old): men, having musculo-skeletal traumatic wounds, of hands, produced by cutting objects, instruments or apparatus. These ones have had need of plastic surgery interventions, especially for hemostasis, and nerves reconstruction. Also, they have had need of the long period of recuperation (3–6 months). The criteria of selection included the following list, which was used to divided the patients in four groups (Table 1).

We evaluated the pain after surgical intervention, at 24 hours [T1], then, every day, 10 days [T2], consecutively, and after their discharge [T3]. With patient’s acceptance we obtained biopsies, from the operated tissues [directly from wound] and samples of blood, to determine the values of proinflammatory cytokines (TNF-alpha, IL1, IL2), in the same periods. To analyze the intensification of oxidative stress we determined the values of malondialdehyde [MDA]; marker of membrane lipoperoxidation and superoxid dismutase (SOD) as an index of endogenous antioxidant potential of plasma.

We divided the group of 50 patients (study group) in subgroup A, B, and C: three classes of patients, from the point of view of the analgesic–anesthetic substances used during anesthesia and the medication necessary for sedation and analgesia in T1, T2 and T3 periods for every group (Table 2).

We calculated the HRQOL, immediately post-operative (T1 at 8–24 hours), using the following questions:

- recognizing to be anxious or depressed,
- recognizing to be moderately anxious or depressed,
- recognizing to be extremely anxious or depressed,

and compared the responses with the Hospital Anxiety and Depression Scale (HADS).

We noted the types of problems encountered and insisted on the manner of their reporting such as: pain, (scale of pain), dyspnea (respiratory rate), muscular weakness, weight loss, cognitive dysfunction (scale), most of them reflecting stress response, but majority belonging to one depressive status. So many patients have need of being transferred to the neuropsychiatric centre.

We used the quantification of pain (subjective) by means of numeric scale asked to the patient to answer to the following questions: What number could give to the pain, when it is the worst that it gets and when it is the actual pain? What number on a 0 to 10 scale could for this pain, recognizing to be extremely anxious or depressed, and compared the responses with the Hospital Anxiety and Depression Scale (HADS).

Frequently, patients could not answer to these questions, and for these ones we explained the Numeric Rating Scale in another manner: 0 = no pain; 1–3 = mild pain; 4–6 = moderate pain; 7–10 = severe pain.
The interdisciplinary team in collaboration with the patient/family (if appropriate) can determine appropriate interventions in response to Numeric Pain Ratings.

We studied also, the morphopathological aspects from the bioptic samples, obtained from the three groups of wound healing.

We were trying to make a correlation between the degree of pain expression by means of pain scales (control of the psychological status), the dose of analgesics and sedatives and the quality of wound healing (cytokines), and antioxidant therapy, to evoke the role of association between psychological status—antioxidative therapy, on the immune system, and on the wound healing.

Because, the psychological impact in surgical patients has been a major concern the last decade, and the most important aspects are: anxiety and depression, post-traumatic disorders (PTSD) nightmares and hallucinations, we used the Ramsay Sedation Scale, immediately, in postoperative period (T1) to obtain another kind of psychological parameters, those about the needs of patient’s sedation (Table 3).

Table 3 – Ramsay Sedation Scale

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>2</td>
<td>Patient awake, cooperative, tranquil.</td>
</tr>
<tr>
<td>3</td>
<td>Patient awake, responds to commands only.</td>
</tr>
<tr>
<td>4</td>
<td>Patient asleep, brisk response to light glabellar tap or loud auditory stimulus.</td>
</tr>
<tr>
<td>5</td>
<td>Patient asleep, sluggish response to light glabellar tap or loud auditory stimulus.</td>
</tr>
<tr>
<td>6</td>
<td>Patient asleep, no response to light glabellar tap or loud auditory stimulus.</td>
</tr>
</tbody>
</table>

Results

Clinical parameters

The response obtained, from patients, to pain scale, was very different and extremely variable, so there were values of: mild pain – groups A and B, 33%; moderate pain – groups A–C, 56%; severe pain – group C, 11%. For the T2–T3 periods, we tried to obtain the 2–3 level of sedation, by means of adequate and target psychological and therapeutic management.

Group A

We did not apply the pharmacological substances. Only explanation, reassurance, encouragement were sufficiently to recovery the normal psychological status.

Group B

For sleep disturbances: we used the tranquillizers: benzodiazepines, local anesthetics or ketamine, associated with antioxidants (vitamins and diet).

Group C

For extremely intense pain, discomfort, agitation, we have administrated midazolam to reduce the stress response, especially for arterial hypertension.

For the loss of control and depression, we received the recommendation from psychologist to apply the antidepressant and/or antipsychotics.

Morphological parameters

There are, also, different morphological aspects: for the group A, the wound healing was observed, firstly, initiating by a neutrophil granulocytic infiltration (T1), sign of a good reactivity. For group B is observed the presence of edema and vasodilatation, which represents an unfavorable effect on local evolution, and the transformation of the inflammation in local infection (T2, T). Necrosis in group C was a sign for the necessity of reintervention. These aspects are presented in the several, following figures (Figures 2–5).
interference with cytokines production. Benzodiazepines
anxiolysis and sedation. We used this kind of pharmacological substances to produce IL1, IL6 and TNF-alpha, that was the reason they could bind to receptors on macrophages and inhibit the ability of immune function. Benzodiazepines have antioxidant effects, but they could inhibit the antioxidant capacity in cells to remove oxidative stress.

The values of malondialdehyde, marker for lipoperoxidation and intensity of oxidative stress (Tables 4 and 5).

Table 4 – MDA values in T1 (p<0.05)

<table>
<thead>
<tr>
<th>MDA [µM/mL]</th>
<th>Control group (n=20)</th>
<th>Group A (n=15)</th>
<th>Group B (n=17)</th>
<th>Group C (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA variation [%]</td>
<td>22.5</td>
<td>42.5</td>
<td>24.8</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Table 5 – SOD values in T1 (p<0.05)

<table>
<thead>
<tr>
<th>SOD [U/mL]</th>
<th>Control group (n=20)</th>
<th>Group A (n=15)</th>
<th>Group B (n=17)</th>
<th>Group C (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation [%]</td>
<td>27.1±0.67</td>
<td>5.18±0.21</td>
<td>5.57±0.75</td>
<td>3.56±0.25</td>
</tr>
</tbody>
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Increasing of SOD in T1 evidentiates the ability of cells to remove the oxidative stress. In groups A and B, the antioxidant endogenous capacity was increased.

Several analgesics and sedatives are known to have an antioxidant effects, but they could inhibit the immune function in vitro, activating the mechanism of interference with cytokines production. Benzodiazepines bind to receptors on macrophages and inhibit the ability to produce IL1, IL6 and TNF-alpha, that was the reason we used this kind of pharmacological substances for anxiolysis and sedation.

Discussion

Using a particularly definition of pain scale (McGill Questionnaire), we report that over 90% of operated patients have an emotional lability and because of that more than 70% cannot complete rapidly, pain self-assessment scales.

We noted that pain self-assessment scales could be used with cautions, and observed in relationship with postoperative evolution of wound healing.

Several studies [21–23] have attempted to determine the most appropriate scale for cognitively impaired elderly, but report conflicting results. Ferrell BR et al., found completion rates that vary from 44% for the HVAS (lowest completion rate) to 65% for the present pain intensity subscale of the McGill Questionnaire, a combined word and number scale [9]. These findings are consistent with those of Krulewitch H et al. [24], who report the worst completion rate for a visual analog scale (53%) and the faces scale (53%) compared to the pain intensity scale (62%), a combined visual and verbal scale. However, Scherder EJ and Bouma A [25] describe a very high completion rate for the Colored Analog Scale (CAS) (100% in early Alzheimer’s disease and 80% in mid-stage Alzheimer’s disease) and a much lower one for the faces scale (60% and 30%, respectively). These differences may be explained in part by unclear definitions of comprehension, the absence of comprehensive neuropsychological evaluations leading to uncertainty in assessments, and the lack of standardized instructions prior to scale administration.

In our experience, tested self-assessment scale was equally reliable, may be, because there was a poorer comprehension of the faces scale, and no detect differences among the groups. Our study included only hospitalized patients, in which pain assessment is essential, for patients’ evolution. To our observation it was a poor correlation with one-dimensional self-assessment tools, so clinicians will not apply observational scales routinely, in neuropsychiatric patients as many of these are incapable of reporting their own pain (under- or over-estimation). Observational scales were designed, and should be reserved, for those few patients who have demonstrated that they can complete a self-assessment and in these conditions, it is possible to include this parameter, as an index of prediction of wound healing.

We noted also, that the others studied parameters are not satisfactory, single used for prediction of wound healing, but together, they make a resultant, which could be interpreted and could assure the elaboration of a good prediction.

Conclusions

The proportion of patients reporting pain is modifying with conditions, representing the individual, quality of life.

Our results using the numeric rating scale, does not support a relationship between cognitive function and reduced or exacerbated sensitivity to pain.

The observational rating scale, correlated modestly with self-assessment by the patient, usually it is over or underestimated the level of pain, but the low scores did not rule out the presence of pain.

The morphological aspects are not correlated with the pain expression, but the discomfort and agitation...
have a great influence upon the bad evolution of organism and of wound healing.

It is better to appreciate the psychological status using the Richmond Agitation Sedation Scale (RASS), to choose the best sedation-scoring tool, for difficult patients, like those who form the C-group.

Patients receiving antioxidants as supplementary medication or included in diet enteral alimentation have a considerable, good time and quality of wound healing.

It is a strong correlation between pain scale, agitation, alcoholism and bad evolution. The level of sedation influence favorable the evolution of wound healing in emotional and depressive patients.

References


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