

Anxiety in patients undergoing fast-track knee arthroplasty in the light of recent literature

Paweł Ziętek¹, Joanna Ziętek², Karina Szczypiór¹

¹ Department of Orthopedics and Traumatology PUM in Szczecin
Head: prof. dr hab. n. med. A. Bohatyrewicz

² Psychiatric Center, SPS Health Care “Zdroje” in Szczecin
Head: dr D. Spertusiak-Rogoza

Summary

The rapid progress in knee implants technology and operational techniques go together with more and more modern medical programs, designed to optimize the patients' care and shorten their stay in hospital. However, this does not guarantee any elimination of perioperative stress in patients. Anxiety is a negative emotional state arising from stressful circumstances accompanied by activation of the autonomous nervous system. Anxiety causes negative physiological changes, including wound healing, resistance to anesthetic induction, it is associated with an increased perioperative pain and prolong recovery period. The purpose of this work is to present the current state of knowledge on the preoperative anxiety and discuss its impact on pain and other parameters in patients undergoing fast-track arthroplasty of big joints. The work also shows selected issues of anxiety pathomechanism, and actual methods reducing preoperative anxiety in hospitalized patients. The common prevalence of anxiety in patients undergoing surgery induces the attempt to routinely identify patients with higher anxiety, which may be a predictive factor of worse results after TKA. Undertaking widely understood psychological support in these patients before and after the operation could be a favorable element, which would influence the final result of the treatment of patients after big joints arthroplasties.

Key words: anxiety, knee arthroplasty, fast-track

Introduction

In the world of computers' accelerators, more and more faster and dynamic cars, in times of overcoming outer space or races against the speed of sound, the willingness to shorten a clinical pathway after big surgical procedures seems to be obvious trend of today's intensive pace of life. However it would be a great ethical failure, if only such a goal would be in creators and continuers mind of enhanced recovery.

Accelerated mode of hospitalization (fast-track /f.t./, accelerated recovery program) is a multidisciplinary optimization of treatment, nursing, and rehabilitation

[1], with a purpose to achieve a psychophysical performance as soon as possible and simultaneous aiming to reduce the risk of peri- and postoperative complications. In the light of literature it is easy to notice, that there is no universal solutions to achieve this objective; the more that the target aspect of shorten hospitalization is not the only aim. The short hospitalization is supposed to be only an important component of the best possible and comfortable for the patient treatment program during his stay on the ward.

Taking higher number of total knee arthroplasties (TKA) into consideration [2, 3] it should be emphasize, that degenerative joint disease is a civilization disease. Because of increasing coverage of population, it is necessary to search actively for approaches leading to the achievement of better results after the surgery as soon as possible, a smaller number of postoperative complications, reduce a perioperative mental stress, reduce costs, finally getting growing satisfaction of the patient after the operation [1, 4]. F.t. program consists of a detailed patient education related to the presentation of treatment and rehabilitation course, effective pain treatment during patient stay in the ward, and the implementation of early and intensive rehabilitation after surgery.

The objective of modern fast-track programs is also aiming to reduce a peri- and postoperative stress in patient and achieve a highest possible satisfaction of patient [5]. F.t. should include all patients undergoing surgical treatment and should not be selective towards hospitalized patients [6]. The assumption is also to achieve the highest possible satisfaction of patient [5]. Many authors highlights a f.t. program as safe, because a reduced risk of deep venous thrombosis, pulmonary embolism, pneumonia, urinary retention, and hospital bacterial flora infections are connected with shorten stay in hospital and early, intensive rehabilitation [7]. A financial advantage compared to the standard mode of hospitalization is also significant [1]. The realization of f.t. program is sometimes disturbed by social aspect, which in Napier et al study was the most common cause of prolonged hospitalization in 25% of patients staying at hospital above 72 hours [8]. On the other hand an effectiveness of quick rehabilitation may be reduced by the perioperative anxiety that is common in persons undergoing surgery [9].

The purpose of work is to present the current state of knowledge on the preoperative anxiety and discuss its impact on pain and other parameters in patients undergoing fast-track arthroplasty of big joints. The work also shows selected issues of anxiety pathomechanism, and actual methods reducing preoperative anxiety in hospitalized patients.

Literature review was made using a database Medline/Pubmed (preoperative/anxiety, fast-track/knee arthroplasty, knee pain, double-blind, randomized, systematic). The analysis included articles published in the period from January 2010 to March 2014, with particular regard to the randomized controlled trials (RCT). Due to the importance of the presented research results, some scientific papers from previous period were quoted. The eligibility criteria for studies included in the review were studies with the statistically documented relationship between anxiety and perioperative pain and other parameters in patients undergoing TKA, with current state of knowledge

of the pathophysiology and pathomechanism of anxiety, and also prospective, randomized studies presenting the results of the issue of anxiety in patients undergoing fast-track arthroplasty, especially knee arthroplasty. The case reports were excluded from the analysis.

The selected issues on anxiety pathomechanism

The fibroblast growth factor (FGF) and brain derived neurotrophic factor (BDNF) play important role in etiology of modulating of anxiety and other emotional reactions, as in mood disturbances [10, 11]. After triggering a harmful stimulus, for example chronic stress, the levels of neurotrophins and hypertrophy of the bed nucleus of the stria terminalis (BNST) neurons in limbic brain regions, including the ventral hippocampus, amygdala and BNST, known to be involved in the modulation of emotional responses. As a result, the neurotransmission imbalance and synaptic plasticity impairment is created [12, 13, 14, 15]. In anxiety pathomechanism an important role is played by the efferent pathways from the central nucleus of the amygdala travelling to the parabrachial nucleus (resulting in dyspnea and hyperventilation), the dorsomedial nucleus of the vagus nerve, nucleus ambiguus (activating the parasympathetic nervous system), and the lateral hypothalamus (resulting in sympathetic nervous system activation). The role of ventral hippocampus in anxiety pathophysiology is still the matter of discussion, however; part of the authors acknowledge the relationship between the increased activity of this brain region, and increased emotionality [16], while other do not confirm this association [17]. In 2013, using optogenetics tools to activate and to inhibit granular cells in the ventral hippocampus, Fournier and Duman [18] saw that elevating activity in this area suppresses anxiety in the elevated plus maze.

In recent years the attention of researchers focused on neudesin, known as a neurotrophic factor of neurons [19, 20]. The neudesin modulating of anxiety behaviors occurs through effects on granular cells of hippocampus and changes of dopaminergic activity. The modulating neudesin role in anxiety could be linked with the putative neurotrophic function, but further studies need to determine why this effect is specific for anxiety [20].

Assessment of anxiety

A systematic literature review carried out in 2014 by Phyomaung et al. [21] has emerged 5 the most widely used English-speaking anxiety scales: Arthritis Impact Measurement Scales, Hospital Anxiety and Depression Scale (HADS), Beck Anxiety Index, Zung Anxiety Inventory, and the State-Trait Anxiety Inventory (STAI).

Preoperative anxiety and pain

The presence of main disease, waiting for the operation, the operative pain, keeping an intraoperative awareness, inadequate knowledge about the outcomes, uncertainty about the necessity of surgery, not trusting the surgeon or seeing the scalpel are just some

of the factors that increase anxiety in the patient prior to surgery [9, 22]. Real or only implied threat (stressful situation) activates the hypothalamo-pituitary-adrenocortical system (the so-called axis of stress). The stress response of hemodynamic system includes among other increased ejection fraction of the heart and increasing blood pressure, which is induced by endocrine regulatory mechanisms and the autonomic nervous system, including the release of adrenocorticotropin and corticotropin-releasing-hormone, norepinephrine, epinephrine, dopamine, oxytocin, vasopressin, prolactin, cytokines, tumor necrosis factor alpha, acute-phase proteins (C-reactive, leptin) [23, 24, 25]. Such induced anxiety can contribute to resistance to anaesthetic induction, poorer wound healing (through induction of stress hormones which regulate healing: cortisol, noradrenaline, adrenaline), as well as to more intensive perception of post-operative pain. Some authors even suggest that the state anxiety is a psychological predictive factor of developing chronic postoperative pain [26]. In turn, Kil et al. [27] noticed that the higher level of preoperative anxiety predisposed to feel more of pain only immediately after surgery. So, in this context the identification of patients with an increased anxiety would be essential. This would allow to introduce of the individual and more effective pain therapy in these patients.

On the other hand in case of acute pain, an anxiety is the most often suffered emotion, which can turn into a fear and even panic [28]. In 2013 Singh and Lewallen [29] in a large cohort study claimed that next to depression, the anxiety is a prediction factor of persistent pain for 2 years after primary TKA. Also Ellis et al. [30] and Hanusch [3] et al. emphasized the negative impact of psychosomatic symptoms (among others anxiety) on results evaluated one year after TKA [29]. Depression, tendency of somatisation and psychological distress are also the significant predictors of worse results after TKA [31]. However, the anxiety level after surgery also correlates with acute pain during this period [32]. Duivenvoorden et al. [33] stated, that together with the reduction of pain after surgery, the anxiety lowers.

In the light of current literature, however, is not clearly obvious the negative impact of anxiety on postoperative pain. In 2014, PhyoMaung et al. [21] published a systematic review of 6 works and stated that anxiety is not a predictive factor of postoperative knee pain. In their work they stressed a limited evidence proving the conclusions, however.

Personality factors and anxiety, pain, and illness experiencing

In 2014 Gong et al. [34] on the basis of a review of the literature found that negative mood, particularly in depression and anxiety states, intensifies the pain. The authors presented the unpublished up to now a relationship between personality types and clinical outcomes after TKA. They found that the higher the level of extraversion/neuroticism the better is the knee function after surgery. The best functional outcomes occurred in sanguine personalities, the worst – in melancholic. Out of four personalities types, the satisfaction rate was the lowest in choleric personalities despite positive clinical outcomes in relation to pain relief and functional improvement. Patients with higher extraversion (choleric and sanguine types) presented higher functional outcomes; sanguine personalities after operation achieved faster an appropriate level

of knee function in relation to melancholic. On the other hand neurotic patients tended to experience negative emotions such as fear, anxiety, unhappiness, sensitivity to psychological stress, respond negatively when faced with postoperative rehabilitation and even are inclined to catastrophizing.

May anxiety affect postoperative outcomes after TKA?

After surgery, an unspecified group of patients has not any pain reduction, function improving of operated joint, and improving of life quality. At the same time there is no technical operative mistakes, deficiency of implants, nor coexistence of any diseases that could explain the state. In these patients the psychological etiology might be a reason [35, 36]. In current literature functional outcome after TKA can be significantly influenced by psychological factors. In recent years, attention has been drawn to perception of illness in recovery. A perception of illness encompass the patient's own understanding and belief about his illness, its causes, progression and effects [3, 37]. On the other hand a number of publications have documented the existence of a close relationship between anxiety and functional outcomes after TKA [3, 31, 38]. In 2010, Riddle et al. [39] presented the results of research which found a negative impact of anxiety on pain and postoperative knee function. Before, the other authors published such relationship on hip arthroplasty [40]. Patients with bigger preoperative anxiety had also the reduced quality of life after TKA [33]. In prospective study, Brander et al. [41] confirmed the coexistence of poorer postoperative knee function with preoperative anxiety, but the anxiety did not have a decisive influence on knee function. As in case of pain, actually there is no contemporary consensus on negative influence of anxiety on functional outcomes after TKA. In 2012, Vissers et al. [36] in systematic review stated in conclusions, that only mental health (measured with SF-12 or SF36) and pain catastrophizing influence postoperative outcomes.

Anxiety and patient satisfaction after TKA

Despite continuous increase of implantations of knee prosthesis, until 11-25% of patients are not satisfied with outcomes after TKA [42, 43]. This significant percentage of bad results and a large number of arthroplasties realizes the importance of the problem on the one hand, and the need to seek the cause of TKA's failure on the other. Among many predictors of lack of satisfaction after TKA, Bourne et al. [42] in a cross-sectional study listed mostly patients expectations not met, big preoperative knee pain at rest, postoperative complication that require a repeated hospitalization, low knee function during the first year after TKA, and advancing age of patient. Although the authors did not consider in their analysis of the psychological factors, they acknowledged, however, that psychological state is closely correlated with postoperative satisfaction.

Vissers et al. [43] in prospective analysis specified a preoperative and postoperative anxiety as a factor that negatively influence the patient satisfaction 6 months after opera-

tion. It confirms the rightness in taking account of mental state of patients in planning their treatment on surgery wards. At the same time negative psychological factors do not motivate these patients causing them to a passive attitude in the face of disease (or e.g. rehabilitation), and lowering their vitality. Patients with such symptoms, especially older ones, are more likely to report lower subjective scores after surgery, including lowering the quality of life [33]. Hence, a reduction of anxiety can increase a patient satisfaction and scores after TKA [31, 38].

The interpretation of the results must surely be cautious in view of the complex nature of psychological behavior and other factors influencing behavior [31]. Hence, a multidirectional and individualized proceedings towards patients are advisable, of which the best reachable treatment still remains the primary aim [1, 5].

One of the assumptions of f.t. is a reduced hospitalization, which, as rightly suggested by Wetsch et al. [44], may be paradoxically an “undesirable effect”, because it produces in patients mind a question about the necessity and safety of the widespread use of shorter hospitalization, and rise an anxiety as a consequence. Therefore, next to an administration of sedatives preoperatively (i.e. premedication), the preoperative education of patient is very important [5].

Preoperative education

Already at this stage, the word, written, or audiovisual education may contribute to reduce preoperative anxiety [45]. Education should be clear, precise, and understandable. Information have positive effect on “vigilant” patients (those who overcome stressful situations by obtaining as much information as possible). There is no such effect, however, in case of “avoidant” patients (those who reject information and try not to think about what is going to happen). It seems that the most appropriate is to provide patients with the information they require and in an adequate, individual format.

Educational and motivating interview affects a smaller perception of postoperative pain, higher postoperative satisfaction in patient [5, 46] and may result in a reduction of hospital stay for up to 24 hours [47, 48], although some authors do not have confirmed such a relation [45]. In preoperative period education can take place from a few weeks to a few hours before the operation. However, it should take into account that not all information may be duly examined and memorized by the patient [49]. Patients with advanced degenerative changes often belong to a group of people with reduced physical activity, which are characterized by more often impaired executive functions, including episodic memory [50]. Lack of understanding or memorizing the relevant details of preoperative medical talk may intensify a preoperative anxiety in patients.

Therapeutic activities designed to reduce anxiety should also be continued after the operation. The mutual relationship between postoperative anxiety and persistent acute pain has been confirmed by Pinto et al. [32].

Conclusions

Anxiety is a negative emotional state arising from stressful circumstances accompanied by activation of the autonomous nervous system. The anxiety causes physiological changes, including wound healing, resistance to anesthetic induction, is associated with an increased perioperative pain and prolong the recovery period. Common prevalence of anxiety in patients undergoing surgery induces to attempt to routine identification of patients with higher anxiety, which may be a predictive factor of worse results after TKA. Undertaking of widely understood psychological support in these patients before and after the operation could be a favorable element, which would influence the final result of the treatment of patients after big joints arthroplasties.

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Address: Paweł Ziętek

Department of Orthopedics and Traumatology PUM in Szczecin
71-252 Szczecin, Unii Lubelskiej Str. 1