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THE IMPACT OF CARDIAC SURGERY ON ANXIETY AND DEPRESSIVE SYMPTOMS

WPŁYW OPERACJI KARDIOCHIRURGICZNYCH NA WYSTĘPOWANIE OBJAWÓW LĘKOWYCH I DEPRESYJNYCH

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Abstract

Background: Cardiac surgery is associated with physical recovery demands and psychological distress. Anxiety and depressive symptoms may be present before surgery, change during rehabilitation or persist after discharge.

Aim: To review the frequency of anxiety and depressive symptoms after cardiac surgery, factors associated with their occurrence and the effects of supportive interventions.

Methods: To identify articles on anxiety and depressive symptoms following cardiac surgery, the PubMed, Cochrane Library, ScienceDirect, SpringerLink, and Google Scholar databases were searched. Only English-language publications were included.

Results: In a retrospective study of 132,390 cardiac surgery patients, 12.6% had newly documented depression or an antidepressant prescription within one year. In a prospective CABG subgroup, 13 of 89 patients (14.6%) developed depression during follow-up. Early esketamine and dexmedetomidine trials showed lower proportions of positive depression and anxiety screens shortly after surgery, but some effects did not persist. Rehabilitation, education and psychological support were associated with symptom improvement.

Conclusions: Psychological assessment before and after cardiac surgery should distinguish new diagnoses from questionnaire scores. Available findings support individualized follow-up but do not establish the operation itself as the sole cause of subsequent depression or anxiety.

Keywords: cardiac surgery, coronary artery bypass grafting, depression, anxiety, psychological distress, cardiac rehabilitation.

Streszczenie

Tło: Operacjom kardiochirurgicznym towarzyszą wymagająca rekonwalescencja i obciążenie psychiczne. Objawy lękowe i depresyjne mogą występować przed zabiegiem, zmieniać się podczas rehabilitacji lub utrzymywać się po wypisie.

Cel badań: Przedstawienie częstości objawów lękowych i depresyjnych po operacjach kardiochirurgicznych, związanych z nimi czynników oraz efektów wybranych form wsparcia.

Metody: W celu wyłonienia publikacji dotyczących występowania objawów lękowych i depresyjnych po operacjach kardiochirurgicznych przeszukano bazy danych PubMed, Cochrane Library, ScienceDirect, Springer Link oraz Google Scholar. Uwzględniono wyłącznie publikacje anglojęzyczne.

Wyniki: W retrospektywnym badaniu 132 390 pacjentów nowo udokumentowaną depresję lub nową receptę na lek przeciwdepresyjny odnotowano w ciągu roku u 12,6% osób. W prospektywnej podgrupie po CABG depresja wystąpiła u 13 z 89 chorych (14,6%). W badaniach esketaminy i deksmedetomidyny obserwowano mniej dodatnich wyników przesiewowych we wczesnym okresie pooperacyjnym, lecz część korzyści nie utrzymywała się. Rehabilitacja, edukacja i wsparcie psychologiczne wiązały się ze zmniejszeniem nasilenia objawów.

Wnioski: Ocena stanu psychicznego przed zabiegiem i po nim powinna odróżniać nowe rozpoznania od wyników kwestionariuszy. Dane uzasadniają indywidualnie dobraną opiekę, ale nie dowodzą, że sama operacja jest jedyną przyczyną późniejszych problemów psychicznych.

Słowa kluczowe: kardiochirurgia, pomostowanie aortalno-wieńcowe, depresja, lęk, obciążenie psychiczne, rehabilitacja kardiologiczna.

Introduction

Cardiac surgery is an established method of treating advanced coronary artery disease and valvular heart disease. Coronary artery bypass grafting (CABG), valve replacement, and combined procedures can improve cardiovascular treatment outcomes, but recovery is also accompanied by postoperative pain, reduced physical mobility, and uncertainty about returning to everyday activities. Anxiety and depressive symptoms may occur before surgery or intensify during rehabilitation. Sometimes they persist despite a favorable surgical outcome [1][2].

Mental health and cardiovascular disease influence one another. Fear of complications, prolonged hospitalization, and limitations in physical functioning may affect mood, while pre-existing symptoms of anxiety or depression may hinder engagement with treatment and recovery [2][4]. It is therefore important to distinguish symptoms already present before surgery from those that emerge afterward. Likewise, a positive result on a screening questionnaire is not equivalent to a diagnosis of depression confirmed by clinical assessment [3][5].

Literature Review

Emotional difficulties are common after cardiac surgery, but their reported prevalence varies considerably depending on the definition used. A review of 39 studies found that more than half of patients may report at least one symptom of anxiety, depression, or psychological distress after surgery, while at least 10% may meet the criteria for a clinical diagnosis [1]. These figures refer to different phenomena and should not be interpreted as the proportion of people who developed depression for the first time as a result of surgery.

More detailed data were provided by a retrospective analysis of 132,390 patients after cardiac surgery. Within one year, 12.6% had a new diagnosis of depression or received a new prescription for an antidepressant. By comparison, the corresponding proportion was 16.1% after thoracotomy and 6.8% after hip replacement [3]. This finding refers to events recorded in healthcare claims data rather than depression confirmed in every patient through a structured

psychiatric interview. Nevertheless, it shows that psychological problems are documented in a substantial proportion of patients within a year of major surgery.

A prospective study followed 148 patients undergoing CABG, assessing their mental health before surgery and then monthly over the following year. Approximately 11% already had depression before the procedure. Among the 89 patients who were initially free of depression and completed follow-up, 13 developed the disorder, representing 14.6% of this subgroup [5]. The article's abstract reported a slightly different figure of 16%. Unlike a single postoperative questionnaire, repeated assessments make it possible to identify new episodes, although the small number of cases and loss of some participants during follow-up limit the generalizability of the findings.

The period preceding surgery is also important. Estimates summarized in a review of patient-centered cardiac surgical care indicate that preoperative anxiety may affect up to 32% of patients, while depressive symptoms may be present in nearly 20% [8]. These figures come from different studies rather than measurements in a single patient group. In a prospective study of 219 people undergoing CABG, the level of anxiety assessed shortly before surgery was associated with the physical and mental dimensions of quality of life three months later [9]. This association suggests that emotional difficulties present before surgery require attention and should not be regarded solely as a response to subsequent complications.

Mental health often changes during recovery. Among 100 patients who underwent procedures involving cardiopulmonary bypass, including CABG and valve surgery, the mean total score on an anxiety and depression scale decreased from 14.54 to 4.09 points during approximately 22 days of rehabilitation. The anxiety score fell from 7.18 to 2.03 points, and the depression score from 7.36 to 2.87 points [6]. These changes reflect symptom severity measured by a questionnaire and do not mean that the same proportion of patients recovered from clinically diagnosed depression. Similarly, a longitudinal study of 608 patients after CABG found a reduction in anxiety and depressive symptoms during rehabilitation, alongside changes in physical health over six months [7].

However, the course of recovery is not the same for every patient. Symptoms observed immediately after surgery may differ from those experienced several months later, while the patient's health and available support may also change. For this reason, a single assessment before discharge cannot establish whether difficulties have resolved or will return during everyday life [1][7][9]. The available findings support repeated assessment rather than relying exclusively on one postoperative measurement.

The association between anxiety and depression was examined in a cross-sectional study of 272 patients after CABG in Thailand. Greater anxiety was associated with more severe depressive symptoms, while optimism, perceptions of illness, and social support were also related to psychological well-being [12]. In another group of 119 patients transitioning from intensive care to further treatment, more pronounced anxiety and depression were associated with greater fear of disease progression, whereas higher perceived social support accompanied lower psychological distress [13]. Neither study can determine which difficulty appeared first, but both point to the importance of the patient's psychological and social circumstances.

A review of 39 studies identified social relationships, better functional capacity, participation in rehabilitation, physical activity, and preoperative education as factors associated with lower psychological distress. More severe pain and poorer physical functioning were more often accompanied by emotional difficulties, while findings concerning age and sex were inconsistent [1]. In a prospective study of patients after CABG, subsequent depression was also associated with previous depressive episodes, poorer baseline functioning, mild cognitive impairment, and lower perceived social support. Middle cerebral artery stenosis, however, did not explain the occurrence of new depressive episodes [5]. These results do not support the existence of a single, simple biological cause of postoperative depression.

The role of the surgical procedure itself is harder to determine. Most available studies concern CABG, while isolated valve operations and combined procedures have been evaluated less frequently. Studies comparing valve replacement with CABG have also examined patient-reported changes in memory and other neuropsychological functions [11]. Such subjective cognitive complaints are relevant to recovery but should not be counted as new cases of depression. Similarly, differences in the prevalence of depression documented after various major operations may reflect the underlying disease, postoperative pain, hospitalization, or other factors rather than the surgical technique alone [3].

Changes in body image may contribute to emotional distress after open-heart surgery. A meta-analysis of four studies examined the association of sternotomy scars with anxiety and depressive symptoms. In some analyses, more extensive scarring was associated with more severe depressive symptoms, whereas the findings for anxiety were less clear [14]. The publication also contains inconsistencies in its reported statistical results, so it does not justify firm conclusions about the independent effect of scarring. Physical appearance should therefore be considered a possible source of difficulty for individual patients rather than a confirmed predictor of clinical depression.

Additional difficulties may be associated with admission to an intensive care unit. A scoping review of seven studies on post-intensive care syndrome in cardiac surgery patients found wide variation in the prevalence of mental health problems, ranging from 16% to 99% [15]. This broad range reflects differences in the symptoms assessed, patient groups, and measurement instruments. It cannot be used as an estimate of the prevalence of diagnosed depression. Psychological distress may also coexist with cognitive difficulties, sleep disturbances, and impaired physical functioning, complicating patient assessment during the early stages of recovery [11][15].

Several biological mechanisms may help explain the relationship between cardiovascular disease and depressive symptoms. These include inflammatory processes, changes in the regulation of stress hormones, and altered activity of the autonomic nervous system. Such mechanisms may already be present before surgery [4]. A randomized study of esketamine administered during valve surgery observed changes in inflammatory and neurobiological markers accompanied by changes in postoperative mood assessment scores [16]. However, this does not establish that a particular biomarker caused the improvement or that cardiac surgery itself caused a mental disorder.

Depressive symptoms may also affect the pace at which patients regain functional independence. In a prospective study of 100 patients after cardiac surgery, higher depression scores were associated with a slower return to independence, social contact, and personal interests in the early postoperative period. After six weeks, more severe symptoms were also linked to a later return to work [17]. These findings are consistent with observations concerning the association between preoperative anxiety and subsequent quality of life, as well as parallel improvements in physical and mental health during rehabilitation [7][9]. Proper healing of the surgical wound does not necessarily mean that the patient's previous level of functioning has been restored.

Not all long-term psychological consequences take the form of depression or anxiety disorders. In a study of 210 people five years after cardiac surgery, probable surgery-related post-traumatic stress disorder or complex post-traumatic stress disorder was identified in 5.2% of participants [18]. These diagnoses are distinct from depression and should not be added to its reported prevalence. A review of 16 randomized studies involving 1,335 patients found that cognitive training was associated with improved cognitive functioning and lower anxiety and depression scores, although the quality of the evidence was rated as low to moderate [19]. The

findings point to overlapping needs in emotional and cognitive recovery but do not demonstrate prevention of newly diagnosed mental disorders.

Interventions intended to reduce postoperative symptoms have produced promising but often short-lived results. In a randomized study of 142 patients undergoing surgery for valvular heart disease, 7.0% of those receiving esketamine during induction of anesthesia had depression scores above the prespecified screening threshold on postoperative day seven, compared with 31.0% in the placebo group. For anxiety, the corresponding proportions were 11.3% and 35.2% [16]. These differences concern questionnaire results in the early postoperative period and should not be presented as a reduction in the incidence of clinically diagnosed depression persisting for many months.

A similar distinction is important in a randomized study of 200 patients undergoing elective cardiac surgery. After one week, a positive depression screening result was found in 11% of patients receiving dexmedetomidine and 31% of those receiving placebo, while anxiety symptoms occurred in 8% and 21%, respectively. By postoperative day 30, there were no longer clear differences between the groups in depression, anxiety, or quality of life [20]. Thus, the early benefits did not persist throughout even this relatively short follow-up period.

Pain control may affect patients' psychological well-being. In a randomized study of 104 people after cardiac surgery, a pain-management regimen combining sufentanil with esketamine was associated with less severe pain and lower depression and anxiety scores than sufentanil alone. The mean depression score was 7.52 points in the combination-treatment group and 13.84 points in the comparison group, while the corresponding anxiety scores were 8.84 and 12.64 points [21]. Because pain and psychological well-being improved at the same time, the study could not establish to what extent these changes resulted from better analgesia and to what extent from a separate effect of esketamine on mental health. Pharmacological studies used different treatment regimens and do not establish which drug should be routinely used to prevent postoperative depression [16][20][21].

Another approach involves psychological and educational support. A systematic review of randomized studies of cognitive behavioral therapy (CBT) after CABG found reductions in anxiety and depressive symptoms, together with improvements in selected aspects of quality of life, patient satisfaction, and the course of hospitalization [22]. However, the interventions varied, some studies included small groups, and data on long-term benefits remained limited. The results support access to psychological care when needed but do not identify a single CBT program appropriate for all patients.

Preparation for surgery may reduce immediate anxiety about the procedure. In a randomized study of 114 patients scheduled for CABG, an educational video presenting the experiences of people who had undergone a similar operation reduced preoperative anxiety more effectively than a conventional video or standard education. Four weeks after surgery, anxiety and depression scores had decreased in all three groups, without a clear advantage for the approach based on other patients' experiences [10]. This result distinguishes emotional preparation before surgery from prevention of persistent postoperative disorders.

Remote support after discharge has also been evaluated. In a study of 80 patients after CABG, six weeks of SMS reminders and assistance with rehabilitation were associated with lower depression, anxiety, and stress scores than standard care [23]. Another randomized study enrolled 174 patients after CABG in a year-long online education and self-management program. More favorable anxiety and depressive symptom scores emerged in the intervention group in months nine and twelve, alongside better adherence to recommendations and improvements in selected aspects of quality of life. However, the time free from major cardiovascular and cerebrovascular events was not prolonged [24]. These programs may therefore improve psychological well-being without necessarily changing the subsequent course of cardiovascular disease.

Simple breathing exercises have also been studied during recovery. In a randomized study of 80 patients after CABG, following a short deep-breathing program, the mean anxiety score decreased from 10.35 to 8.20 points, and the depression score from 10.45 to 7.65 points; sleep quality also improved [25]. Another study compared incentive spirometer exercises performed both before and after surgery, or only after surgery, with standard care. In the exercise groups, less severe anxiety and pain were observed during the first five postoperative days [26]. These studies primarily concerned short-term symptoms and do not demonstrate that breathing exercises prevent persistent anxiety or depressive disorders.

A synthesis of 17 studies involving 1,227 patients after CABG found that yoga-based interventions were associated with reduced anxiety and pain and favorable changes in selected markers of stress and inflammation [27]. The authors rated the strength of the evidence as moderate. These findings suggest a possible role for complementary exercises combining physical activity and mental focus, but they do not justify replacing appropriate cardiac rehabilitation or treatment of mental disorders with yoga when such care is needed.

Less conclusive findings were obtained in studies of virtual reality. In the VRECOVERY trial, 192 patients were randomly assigned to virtual-reality distraction or standard care, but only 100

completed the study. Pain was reduced, whereas no clear reduction in anxiety was demonstrated compared with the control group [28]. In a smaller pilot study involving 36 patients, both music sessions and virtual-reality mindfulness exercises were associated with lower preoperative anxiety, without convincing evidence that either method was superior [29]. These findings are preliminary, particularly because of the small numbers of participants and incomplete follow-up.

Comparison of the available studies demonstrates the importance of distinguishing a new diagnosis of a mental disorder from reduced symptom severity as measured by a questionnaire. The large study based on administrative data assessed documented diagnoses or issued prescriptions, whereas rehabilitation and intervention studies generally measured mental health at specified follow-up points [3][6][7][16][20]. Their findings should not be combined as though they concerned the same outcome. Differences in the types of operations, patient characteristics, and follow-up durations also prevent a single reliable estimate of postoperative depression prevalence from being determined for all cardiac surgical procedures.

Overall, the available evidence supports mental health assessment before surgery, during recovery, and after discharge. A positive PHQ-9, HADS, or similar screening questionnaire result should lead to an appropriate clinical assessment rather than automatically being regarded as a psychiatric diagnosis. Further support may include rehabilitation, education, social assistance, psychological treatment, or relief of chronic pain [1][2][22]. Future studies should account for baseline mental health, separately identify new cases of disorders and changes in symptom severity, and examine whether improvements persist beyond the first few weeks after surgery [5][17][20].

Conclusions

Anxiety and depressive symptoms commonly accompany cardiac surgery, but their reported prevalence depends on how they are identified and when assessment takes place. In a large retrospective study, 12.6% of patients had a new diagnosis of depression or an antidepressant prescription recorded within one year. In a smaller prospective study after CABG, depression developed during follow-up in 13 of 89 patients who did not initially have the disorder and completed the study [3][5].

Pre-existing emotional difficulties, postoperative pain, functional limitations, and the level of social support are associated with mental health during recovery. Depressive symptoms may delay the return to independence, social activities, and work, so mental health assessment should be included in cardiac rehabilitation [1][12][13][17].

Selected pharmacological, psychological, educational, and rehabilitation interventions may reduce anxiety or depressive symptoms. However, their effects differ across studies and follow-up periods. Some benefits are observed during the first week but are no longer evident after a month [16][20], while longer support programs have shown improvement at later stages of recovery [24].

The available evidence does not establish that cardiac surgery itself causes every subsequent depressive episode or that one type of procedure is invariably associated with a greater risk of mental disorders. Repeated screening, clinical assessment when indicated, and coordinated physical and mental healthcare are justified, together with more reliable prospective research into the long-term consequences of treatment [2][3][5][11].

Author Contributions

Conceptualization, Mikołaj Czerwonka; methodology, Mikołaj Czerwonka; investigation, Julia Kot and Wiktoria Sochal; resources, Mateusz Sobierajski; validation, Mateusz Sobierajski; visualization, Wiktoria Sochal; writing- original draft preparation, Mikołaj Czerwonka, Julia Kot, Wiktoria Sochal and Mateusz Sobierajski; writing – review and editing, Mikołaj Czerwonka and Mateusz Sobierajski; project administration, Mikołaj Czerwonka

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Declaration of AI and AI- assisted Technologies in the Writing Process

The author used ChatGPT solely for the purpose of translating a small portion of the manuscript into English. The translated text was subsequently reviewed and approved by the authors, who take full responsibility for the scientific content of the publication.

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