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Original Article

Multidisciplinary Management of Gastric GIST in a Patient with Severe Ischemic Cardiomyopathy Requiring Implantable Cardioverter-Defibrillator: A Case Report

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ABSTRACT

Background: Gastrointestinal stromal tumors (GISTs) are rare mesenchymal neoplasms of the gastrointestinal tract. Their surgical management can be complicated by severe comorbidities, particularly advanced cardiovascular disease. We report a case of gastric GIST in a patient with ischemic cardiomyopathy, recurrent coronary interventions, and reduced ejection fraction, requiring implantable cardioverter-defibrillator (ICD) placement prior to tumor resection.

Case presentation: A 67-year-old man with a history of myocardial infarction, coronary artery bypass grafting, multiple percutaneous coronary interventions, and chronic heart failure presented with dyspnea, chest discomfort, and fatigue. During evaluation, an ulcerated gastric mass (cT3N0) consistent with GIST was identified. Echocardiography revealed an ejection fraction of 35% with apical aneurysm. Holter monitoring showed marked bradyarrhythmia (min heart rate 38bpm, mean heart rate 48 bpm) and atrioventricular block. Given the high anesthetic risk, a multidisciplinary tumor board recommended initial cardiac optimization. The patient underwent implantation of a dual-chamber ICD (Biotronik Rivacor 5 MRI DR) and was stabilized with guideline-directed medical therapy and intermittent levosimendan infusion.

Outcome: Following optimization, the patient's clinical status improved, with ejection fraction increasing to 37% and resting heart rate stabilized around 56 bpm. He subsequently underwent partial gastrectomy with duodenal anastomosis. Histology confirmed a low-risk GIST (M8936/3, <5 mitoses/50 HPF). The postoperative period was uneventful.

Conclusion: A staged multidisciplinary strategy based on preoperative cardiovascular optimization was associated with a reduction in the risk of perioperative cardiovascular mortality in a patient with high cardiac risk. This clinical case demonstrates the importance of individualized risk assessment and coordinated decision-making between cardiology and oncology teams in preventing potentially fatal cardiovascular complications while ensuring continuity and adequacy of oncologic treatment.

Keywords: Gastrointestinal Stromal Tumor; Ischemic Cardiomyopathy; Implantable Cardioverter-Defibrillator; Multidisciplinary Management; Cardiac Optimization

Introduction

Gastrointestinal stromal tumors (GISTs) account for approximately 1–2% of primary gastrointestinal malignancies [1]. In recent years, the survival of cancer patients has markedly improved due to advances in targeted therapies and immunotherapy [2,3]. Consequently, cardiovascular complications have emerged as a leading cause of morbidity and mortality in this population, giving rise to the rapidly evolving field of cardio-oncology [4,5]. Among these complications, life-threatening arrhythmias represent a major clinical challenge, resulting both from the cardiotoxicity of anticancer therapies—such as anthracyclines, HER2 inhibitors, and tyrosine kinase inhibitors—and from the progression of structural heart disease [6,7].

Implantable cardioverter-defibrillators (ICDs) are well established as a cornerstone of primary and secondary prevention of sudden cardiac death in patients with heart failure and documented arrhythmias [8]. However, their use in oncology patients remains controversial. Contributing factors include the limited life expectancy of certain patients, the risk of perioperative and infectious complications, and the absence of randomized controlled trials in this specific population [9,10]. Nevertheless, accumulating evidence suggests that in carefully selected patients with a controlled malignant process and a high risk of arrhythmic death, ICD implantation can significantly influence prognosis and quality of life [11,12]. Within the framework of personalized medicine, therapeutic decisions should be based on an integrated assessment of both oncologic and cardiovascular risk rather than a single-disease paradigm [13].

Surgery remains the mainstay of treatment, but in patients with significant comorbidities, particularly advanced ischemic cardiomyopathy, perioperative management poses unique challenges. The use of implantable cardioverter-defibrillators (ICDs) for primary prevention in patients with ischemic heart disease and left ventricular dysfunction has been validated by large randomized trials such as MADIT-II and SCD-HeFT [14].

In Kazakhstan, cardiovascular diseases (CVD) and cancer remain the leading causes of mortality. According to the Ministry of Health of the Republic of Kazakhstan, in 2022, the cancer incidence rate was 199.0 per 100,000 population, with a mortality rate of 66.4 per 100,000. Survival rates for certain malignancies, such as hepatocellular carcinoma and pancreatic cancer, remain low, while specific national survival data are limited. Despite declining to 241.6 per 100,000 in 2017, CVD mortality still exceeds European averages. Improving cancer survival rates further expands the intersection between these disciplines, emphasizing the need for integrated cardio-oncology services. Regarding device-based therapy, Kazakhstan has made significant progress, performing 2,263 implantable cardioverter-defibrillator (ICD) procedures between 2017 and 2019. Although transvenous ICD implantation is fully reimbursed by the state, overall penetration of ICD therapy remains low compared to Western countries due to high device costs, a shortage of specialized expert centers, and the lack of multidisciplinary care pathways. [16,18]

These epidemiological trends highlight the pressing need to develop cardio-oncology in Kazakhstan. In the absence of national protocols, case reports describing ICD use in oncology patients are of particular value. However, publications on integrating ICD implantation into preoperative optimization are scarce. We present a rare case of a gastric gastrointestinal stromal tumor (GIST) in a patient with severe ischemic cardiomyopathy, where a multidisciplinary approach enabled safe oncological surgery.

Case Presentation

Patient Information

A 67-year-old male was admitted to the cardio-oncology department with complaints of exertional dyspnea, sensation of shortness of breath, episodic chest discomfort described as pressing pain lasting a few seconds without radiation or clear relation to exertion, rapid fatigability, reduced exercise tolerance, and generalized weakness.

His medical history was remarkable for long-standing ischemic heart disease and multiple cardiovascular interventions. He reported a history of smoking for 45 years (4–5 cigarettes daily) and was diagnosed with type 2 diabetes mellitus, treated with oral hypoglycemic therapy (Glucanil 850 mg/day). Surgical history included appendectomy (1976) and lumbar disc hernia repair at the L5–S1 level (1978).

Past Medical and Cardiovascular History

The patient had a well-documented coronary history beginning in 2012, when he experienced an acute myocardial infarction, followed by percutaneous coronary stenting (although original records were partially unavailable). In 2015, he was rehospitalized for acute coronary syndrome and underwent a double coronary artery bypass grafting (CABG-2) procedure, with left internal mammary artery (LIMA) graft to the left anterior descending artery (LAD) and a saphenous

vein graft to the diagonal branch. Timeline of clinical history and interventions are presented in Table 1.

In May 2019, he again presented with anginal chest pain and subsequently underwent percutaneous coronary intervention (PCI) with stenting of the right coronary artery (RCA). By November 2022, his clinical status worsened with increasing symptoms of heart failure. Echocardiography revealed akinesis of the apical segments, left ventricular apical aneurysm, and reduced ejection fraction (EF) of 42%. Coronary angiography demonstrated multivessel disease, including chronic LAD occlusion with distal perfusion through grafts and additional stenoses of the left circumflex artery (LCx).

On January 30, 2023, he underwent stenting of the LCx. Subsequent Holter ECG monitoring (May 2, 2023; duration 23 h 24 min) showed sinus rhythm with marked bradyarrhythmia: mean heart rate 48 bpm, minimal heart rate 38 bpm, 13 isolated ventricular extrasystoles, first-degree atrioventricular block, and sinus bradycardia during 95% of the recording time.

Table 1. Timeline of clinical history and interventions

Date (Year/Month)	Event / Clinical Course	Findings / Interventions
2012	Acute myocardial infarction	Percutaneous coronary intervention (stenting of coronary arteries)
2015	Hospitalization with acute coronary syndrome	Coronary artery bypass grafting (CABG ×2: LIMA→LAD, saphenous vein graft→diagonal branch)
May 2019	Recurrent angina	PCI with stenting of right coronary artery (RCA)
Nov 2022	Worsening heart failure symptoms	Echo: EF 42%, apical akinesis, LV aneurysm; coronary angiography: multivessel disease, LAD occlusion
Jan 30, 2023	Progression of coronary artery disease	PCI with stenting of left circumflex artery (LCx)
Apr 05, 2023	Gastrointestinal evaluation	EGD: ~4 cm gastric lesion with ulceration, signs of prior bleeding (Forrest-2b); biopsy inconclusive
Apr 07, 2023	Histology	Chronic atrophic gastritis; insufficient material for definitive diagnosis, but CT consistent with GIST (cT3N0)
Apr 04,2023	Control echocardiography before surgery	Echo findings: ICM. Left heart dilation. Apical segment akinesis. Apico-septal segment akinesis. Type 1 LV diastolic dysfunction. Reduced LV systolic function, LVEF 35%.
May 02, 2023	Holter ECG	Sinus bradycardia (mean HR 48 bpm, min 38 bpm), AV block I°, 13 isolated VES, bradycardia >90% of recording
Jun 2023	Multidisciplinary tumor board decision	High perioperative risk → staged approach with ICD implantation and HF optimization prior to oncological surgery
Jun 2023	Device implantation	Dual-chamber ICD (Biotronik Rivacor 5 MRI DR) implanted; uneventful postoperative course
Jun–Jul 2023	Heart failure therapy optimization	Guideline-directed medical therapy (ARNI/ACEi, β-blocker, MRA, SGLT2i) + cycles of levosimendan infusion; EF ↑ to 37%, HR ↑ to 56 bpm
Aug 2023	Oncological surgery	Partial gastrectomy with duodeno-gastric anastomosis performed; stable intraoperative hemodynamics, no complications
Postoperative (Aug 2023)	Histopathology	GIST, mixed spindle-epithelioid type (M8936/3), <10 cm, mitotic index <5/50 HPF, R0 resection, low risk of progression
Follow-up (Sep 2023 →)	Ongoing care	Dynamic monitoring at cardio-oncology center; ICD functioning adequately, stable clinical condition

Gastrointestinal Evaluation

In April 2023, the patient underwent esophagogastroduodenoscopy (EGD), which revealed a gastric lesion measuring approximately 4 cm, with ulceration and signs of previous bleeding (Forrest-2b). Biopsy demonstrated chronic atrophic gastritis;

however, due to inadequate sampling, tumor growth was not histologically confirmed. Given the endoscopic findings and clinical course, additional imaging was performed, and computed tomography supported the diagnosis of a gastrointestinal stromal tumor (GIST), staged cT3N0.

Multidisciplinary Tumor Board

A multidisciplinary tumor board was convened to discuss the management strategy. Considering the patient's advanced coronary artery disease, ischemic cardiomyopathy, and severely reduced EF, anesthetic and perioperative cardiac risk were deemed extremely high. The consensus recommendation was to delay gastric surgery until cardiovascular stabilization could be achieved. Specifically, the board concluded:

1. The presence of severe sinus bradycardia, reduced EF (35%), and the anticipated need for beta-blockers (which further depress heart rate) necessitated device-based therapy.
2. The patient fulfilled criteria for an implantable cardioverter-defibrillator (ICD) for primary prevention of sudden cardiac death, given ischemic cardiomyopathy with EF ≤35%, apical aneurysm, ventricular ectopy, and post-infarction scar tissue.
3. Cardiac optimization, including ICD implantation and pharmacological therapy for heart failure, should be undertaken prior to oncological surgery.

Interventions and Therapeutic Management

In June 2023, the patient underwent implantation of a dual-chamber ICD (Biotronik Rivacor 5 MRI DR, mode DDD). The procedure was performed via left subclavian access with transvenous placement of right ventricular and right atrial leads. Intraoperative testing confirmed appropriate sensing and pacing thresholds, with effective defibrillation capacity. The postoperative course was uneventful.

Following device implantation, the patient's chronic heart failure therapy was optimized in accordance with guideline-directed medical therapy (GDMT), including renin–angiotensin system inhibition/ARNI, β-blocker, mineralocorticoid receptor antagonist (MRA), and sodium-glucose co-transporter-2 (SGLT2) inhibitor, in maximally tolerated doses.

Levosimendan is an inodilator with several pharmacological advantages over conventional inotropic agents, particularly dobutamine, in patients with decompensated heart failure and reduced left ventricular ejection fraction. Unlike dobutamine, whose effect depends mainly on β1-adrenergic receptor stimulation, levosimendan enhances myocardial contractility by increasing the sensitivity of contractile proteins to calcium without a substantial rise in intracellular calcium concentration. This mechanism allows improvement of systolic function without a marked increase in myocardial oxygen demand.

An important clinical advantage of levosimendan is its preserved efficacy in patients receiving beta-blockers, whereas the hemodynamic response to dobutamine may be attenuated. In addition, levosimendan activates ATP-sensitive potassium channels, producing vasodilation, reducing preload and afterload, improving cardiac output, and decreasing left-sided filling pressures.

The clinical relevance of levosimendan has been demonstrated in randomized studies. In the LIDO trial, hemodynamic response was achieved more frequently with levosimendan than with dobutamine: 28% versus 15%, while 180-day mortality was 26% versus 38%, respectively. In the larger SURVIVE trial, levosimendan did not significantly reduce 180-day mortality compared with dobutamine; however, it was associated with a more pronounced early reduction in BNP levels, suggesting reduced hemodynamic overload and neurohormonal activation. [38,39].

Considering the reduced left ventricular ejection fraction, high perioperative and cardiovascular risk, and the need for hemodynamic optimization, levosimendan was selected as inotropic support in this clinical case. Its use was pathogenetically and clinically justified, aiming to achieve short-term hemodynamic stabilization, improve left ventricular contractile function, and reduce the risk of further heart failure decompensation in a high-risk patient.

Clinical Course and Outcomes

By July 2023, repeat evaluation demonstrated improvement in cardiac function: echocardiography showed EF increased to 37%, Holter ECG revealed a mean heart rate of 56 bpm with adequate device function, and no episodes of sustained ventricular tachyarrhythmia were recorded. The patient reported improved tolerance to physical activity, with greater walking distance on six-minute walk test.

In August 2023, after multidisciplinary reassessment, the patient underwent partial gastrectomy with duodeno-gastric anastomosis. Intraoperative hemodynamic parameters remained stable, with no perioperative arrhythmias or ischemic events. Blood loss was minimal, and no postoperative complications occurred. Histopathology confirmed gastrointestinal stromal tumor of mixed spindle-epithelioid type (M8936/3), size <10 cm, mitotic index <5/50 high-power fields, with negative resection margins and overall low risk of progression.

Follow-up

The patient was discharged under follow-up at a specialized cardio-oncology center. Regular assessment of left ventricular function and device monitoring were recommended, with plans for dynamic follow-up and consideration of adjuvant therapy as indicated.

Discussion

Patient behavior corresponds to the population for which there is the best evidence of the effect of ICD: ischemic cardiomyopathy, post-infarction scar, EF ≤35%, and symptoms of CHF. Large randomized trials and meta-analyses confirm that prophylactic implantation of an implantable cardioverter-defibrillator (ICD) reduces both all-cause and arrhythmia-specific mortality in patients at high risk of sudden cardiac death [20,21,22]. The absolute effect of the intervention directly depends on the baseline cardiac risk, as well as on competing risks of death from other causes, primarily oncological, nephrological, and systemic [23,24].

Even in the classic studies MADIT-II (2002) and SCD-HeFT (2005) it was shown that ICD significantly reduces overall mortality: by 31% (HR 0.69; 95% CI 0.51–0.93; p=0.016) and by 23% (HR 0.77; 95% CI 0.62–0.96; p=0.007), respectively [18,19].

However, in recent years, studies clarifying the boundaries of the clinical benefit of ICD in real populations with a high level of comorbidity have become increasingly important. Thus, a recent 2023 meta-analysis, which included 13 RCTs involving 7857 patients with ischemic and non-ischemic cardiomyopathy, confirmed that prophylactic use of ICD is associated with a reduction in all-cause mortality (OR 0.69; 95% CI 0.55–0.87; p=0.001), but the benefit was expressed mainly in patients with severe systolic dysfunction and low levels of competing risks [21].

At the same time, a 2024 study showed that even in patients with active cancer, ICD can provide significant protection: compared with amiodarone, use of the device was associated with a 53% reduction in the risk of death (HR 0.47; 95% CI 0.29–0.79; p=0.004), but mainly in the group with metastatic or advanced disease; In patients with localized tumors, the survival differences were not significant [24].

Furthermore, the REFINE-ICD (2025) trial, which aimed to evaluate the benefit of ICD in patients with moderately reduced LV ejection fraction (36–50%) after myocardial infarction and abnormal electrocardiographic markers, showed no reduction in overall mortality over 5.7 years of follow-up (HR 1.07; 95% CI 0.77–1.50; p=0.69), highlighting the limited effectiveness of ICD in intermediate-risk patients [26].

The presence of diabetes is also significant: according to a 2022 meta-analysis that included more than 160,000 patients with implanted ICDs, diabetes mellitus was associated with an increase in overall (HR 1.45) and cardiac mortality (HR 1.68), despite the presence of the device [27].

Against this background, the clinical guidelines of the ESC (2021) and ACC/AHA (2022) emphasize the need for an individual assessment of the prognosis, including life expectancy, the degree of comorbidity and patient preferences. ICD is not recommended for prophylactic implantation if the life expectancy is less than one year, regardless of the ejection fraction, even if there are indications for the cardiac profile [28,29,30].

Thus, the current approach to selecting patients for prophylactic ICD placement should be based not only on cardiac dysfunction parameters but also on a comprehensive assessment of the overall prognosis, using prognostic scales, multiparametric models, and the principles of personalized medicine. Large randomized trials and their meta-analyses confirm that prophylactic ICD placement reduces overall mortality and specifically arrhythmia-related mortality; however, the absolute effect depends on baseline cardiac risk and the competing risk of death from other causes (particularly cancer).

In cardio-oncology practice, an expected survival of more than 1 year is commonly used as a threshold for pursuing invasive cardiac interventions such as ICD implantation. This reflects the need to balance the potential cardiovascular benefit against the risks and prognosis of malignancy [31,32]. When life expectancy is less than 12 months, palliative care is typically prioritized, as aggressive cardiac procedures may reduce quality of life [29].

However, novel cancer therapies—such as immunotherapy and targeted agents—have significantly improved survival in certain malignancies, thus justifying more active cardiac management in selected patients [32,33]. Clinical decisions should be guided by a multidisciplinary evaluation of prognosis and a careful risk–benefit assessment.

In the presented clinic, GIST with a low risk of progression (after resection, the risk of recurrence was very low) offered the potential for a significant improvement in prognosis, justifying aggressive preoperative cardiac intervention.

Ethical and pragmatic considerations

In patients with oncological disease, it is necessary to assess the 'competing risk of death': if the

cancer is aggressive and life expectancy is short (<1 year), implantation may be considered unreasonable. In the present case, the GIST was resectable and classified as low risk of progression, which made the intervention ethically justifiable and pragmatic

The absence of randomized controlled trials specifically involving cardio-oncology patients managed with a sequential strategy of "primary ICD implantation followed by oncologic surgery" significantly limits the generalizability and strength of current clinical inferences. Most available recommendations are derived not from high-level evidence but rather from expert consensus and interdisciplinary risk–benefit reasoning. Nevertheless, existing clinical practice guidelines in heart failure and cardio-oncology provide a sufficiently structured framework to support decision-making in such complex clinical scenarios, especially when applied through a multidisciplinary lens. [37] The absence of randomized controlled trials specifically dedicated to cardio-oncology patients managed with a sequential strategy of 'first ICD implantation — then oncological intervention' significantly limits the ability to extrapolate existing data and reduces the evidential strength of clinical conclusions. Most current recommendations are not derived from high-level evidence but rather from interdisciplinary expert consensus and risk–benefit reasoning. Nevertheless, contemporary clinical guidelines for the treatment of chronic heart failure and for the management of cardio-oncology patients provide a sufficient conceptual and practical framework to support justified decision-making in such complex scenarios, particularly within a multidisciplinary approach [36].

Conclusion

A staged multidisciplinary strategy based on preoperative cardiovascular optimization was associated with a reduction in the risk of perioperative cardiovascular mortality in a patient with high cardiac risk. This clinical case demonstrates the importance of individualized risk assessment and coordinated decision-making between cardiology and oncology teams in preventing potentially fatal cardiovascular complications while ensuring continuity and adequacy of oncologic treatment.

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