HİTİT MEDICAL JOURNAL
HİTİT ÜNİVERSİTESİ TIP FAKÜLTESİ DERGİSİ

e-ISSN: 2687-4717 Cilt|Volume: 7 • Sayı|Issue: 2 - Haziran|June 2025

Clinical Impact of Incidental Findings on Surgical Planning in Coronary Artery Bypass Surgery

Koroner Arter Bypass Cerrahisinde İnsidental Bulguların Cerrahi Planlama Üzerindeki Klinik Etkisi

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Makale Bilgisi | Article Information
Makale Türü | Article Type: Araştırma Makalesi | Research Article
Doi: https://doi.org/10.52827/hititmedj.1675587
Geliş Tarihi | Received: 15.04.2025
Kabul Tarihi | Accepted: 29.05.2025
Yayım Tarihi | Published: 23.06.2025

Atıf | Cite As
Türkmen U, Yiğit G, Çelikten AE, Yalvaç M. Clinical Impact of Incidental Findings on Surgical Planning in Coronary Artery Bypass Surgery. Hitit Medical Journal 2025;7(2):244-254. https://doi.org/10.52827/hititmedj.1675587

Hakem Değerlendirmesi: Alan editörü tarafından atanan en az iki farklı kurumda çalışan bağımsız hakemler tarafından değerlendirilmiştir.
Etik Beyanı: Çalışma için 12/03/2025 tarihinde Hitit Üniversitesi Tıp Fakültesi Araştırmalar Etik Kurulu'ndan onay alınmıştır. Karar no: 2025/54.
İntihal Kontrolleri: Evet (iThenticate)
Çıkar Çatışması: Yazarlar çalışma ile ilgili çıkar çatışması beyan etmemiştir.
Şikayetler: hmj@hitit.edu.tr
Katkı Beyanı: Fikir/Hipotez: UT Tasarım: UT, AEÇ Veri Toplama/Veri İşleme: GY, AEÇ, MY Veri Analizi: UT Makalenin Hazırlanması: UT, AEÇ, MY.
Hasta Onamı: Tüm hastalardan yazılı bilgilendirilmiş onam ve yayın için izin alınmıştır.
Finansal Destek: Bu çalışma ile ilgili herhangi bir finansal kaynaktan yararlanılmamıştır.

Peer Review: Evaluated by independent reviewers working in the at least two different institutions appointed by the field editor.
Ethical Statement: Approval for the study was obtained from the Ethics Committee of Hitit University Faculty of Medicine on 12/03/2025. Decision no: 2025/54.
Plagiarism Check: Yes (iThenticate)
Conflict of Interest: The authors declared that, there are no conflicts of interest.
Complaints: hmj@hitit.edu.tr
Authorship Contribution: Idea/Hypothesis: UT Design: UT, AEÇ Data Collection/Data Processing: GY, AEÇ, MY Data Analysis: UT Manuscript Preparation: UT, AEÇ, MY.
Informed Consent: Written informed consent and consent for publication were obtained from all patients.
Financial Disclosure: There are no financial funds for this article.

Clinical Impact of Incidental Findings on Surgical Planning in Coronary Artery Bypass Surgery

ABSTRACT

Objective: To determine the frequency of incidental findings detected by preoperative non-contrast thoracoabdominal computed tomography (CT) in patients undergoing elective isolated coronary artery bypass grafting (CABG) and to assess their impact on surgical planning.

Material and Method: This retrospective study included 534 patients who underwent elective CABG between January 2021 and December 2024. As part of the routine preoperative assessment protocol, all patients received a non-contrast thoracoabdominal CT scan. Incidental findings were classified by clinical significance. Patients were grouped based on whether surgical planning was altered (Group 1), unchanged with incidental findings (Group 2), or unchanged without findings (Group 3). Demographic, intraoperative, and postoperative data were compared across groups.

Results: At least one incidentaloma was detected in 70.8% of patients. Of these, 12% led to changes in surgical strategy, most commonly off-pump surgery or graft modification. Surgery was canceled in six patients due to high-risk findings. Group 1 patients were older and had lower left ventricular function. Thirty-day mortality did not differ significantly between groups.

Conclusion: Preoperative non-contrast thoracoabdominal CT in elective CABG candidates contributes significantly to both surgical planning and systemic evaluation, enhancing patient safety. Given its accessibility and cost-effectiveness, this method represents a valuable tool in routine preoperative assessment.

Keywords: Coronary artery bypass grafting, Incidentaloma, non-contrast computed tomography, preoperative evaluation, surgical planning.

ÖZET

Amaç: Bu çalışmanın amacı, elektif izole koroner arter bypass greftleme (KABG) cerrahisi planlanan hastalarda, preoperatif dönemde uygulanan kontrastsız torakoabdominal bilgisayarlı tomografi (BT) ile saptanan insidentalomaların sıklığını belirlemek ve bu bulguların cerrahi planlama üzerindeki etkisini değerlendirmektir.

Gereç ve Yöntem: Ocak 2021 – Aralık 2024 tarihleri arasında elektif KABG uygulanan 534 hasta retrospektif olarak incelendi. Tüm hastalara, rutin preoperatif değerlendirme protokolü kapsamında kontrastsız torakoabdominal BT çekildi. Saptanan insidentalomalar klinik anlamlılıklarına göre sınıflandırıldı. Cerrahi plan değişikliği olan hastalar Grup 1, değişiklik olmayanlar insidentaloma varlığına göre Grup 2 ve 3 olarak gruplandırıldı. Demografik veriler, intraoperatif ve postoperatif sonuçlar karşılaştırıldı.

Bulgular: Hastaların %70.8'inde en az bir insidentaloma saptandı. Bu bulguların %12'si cerrahi planlamayı etkiledi. En sık değişiklik off-pump cerrahiye yönelim ve greft planlamasında oldu. Altı hastada operasyon iptal edilerek ileri merkeze yönlendirme yapıldı. Cerrahi plan değişikliği yapılan hastalar daha yaşlı ve sol ventrikül fonksiyonu daha düşük olan grubu oluşturuyordu. 30 günlük mortalite oranı gruplar arasında anlamlı fark göstermedi.

Sonuç: Elektif KABG hastalarında preoperatif kontrastsız torakoabdominal BT, hem cerrahi planlamaya hem de sistemik taramaya katkı sağlayarak hasta güvenliğini artırmaktadır. Uygun maliyeti ve yaygın erişilebilirliği ile bu yaklaşım, klinik uygulamada değerli bir araç olabilir.

Anahtar Sözcükler: Cerrahi planlama, İnsidentaloma, kontrastsız bilgisayarlı tomografi, koroner arter bypass greftleme, preoperatif değerlendirme.

Introduction

Coronary artery disease (CAD) remains one of the leading causes of cardiovascular morbidity and mortality worldwide and continues to be a major public health concern in both developed and developing countries. In cases such as left main coronary artery involvement, multivessel disease, or left ventricular dysfunction, coronary artery bypass grafting (CABG) surgery stands out as an effective treatment option for prolonging survival and improving symptom control (1).

In recent years, the role of imaging modalities in the preoperative planning process of CABG surgery has gained increasing importance. In this context, thoracoabdominal computed tomography (CT) has become a valuable tool not only for evaluating aortic calcifications but also for identifying extracardiac incidental findings (incidentalomas). Particularly in elderly patients, CT scans frequently reveal lesions in the adrenal, renal, pulmonary, and gastrointestinal systems, which may significantly influence both surgical planning and patient management (2–7). In the literature, large-scale studies involving transcatheter aortic valve implantation (TAVI) candidates have clearly demonstrated the clinical impact of incidental findings detected via CT on surgical decisions and overall patient care (8–14). However, there is a paucity of data regarding the impact of systematic non-contrast thoracoabdominal CT screening in patients scheduled for elective isolated CABG.

Moreover, as emphasized in the 2023 AHA/ACC guideline on coronary artery disease, the management of CAD requires a personalized and multidisciplinary approach. The guideline highlights the importance of integrating concomitant systemic conditions identified during the preoperative period into the clinical decision-making process. It further suggests that early detection of asymptomatic but high-risk findings may improve surgical success and long-term survival outcomes (1).

This study aims to evaluate the prevalence of unexpected findings detected by preoperative non-contrast thoracoabdominal CT in patients scheduled for elective isolated CABG and to assess the impact of these findings on surgical planning. In this regard, the study seeks to contribute to clinical practice and fill a gap in the current literature while laying the groundwork for future research.

Material and Method

Study Design and Patient Selection

This retrospective study included 534 patients who underwent elective CABG between January 2021 and December 2024. The study was approved by the Ethics Committee of Hitit University Faculty of Medicine, in accordance with the principles of the Declaration of Helsinki (Approval No: 2025/54). Written informed consent was obtained from all patients prior to treatment.

Patient data were retrospectively analyzed from electronic medical records and hospital files. As part of the standard institutional protocol, all patients scheduled for elective open-heart surgery undergo non-contrast thoracoabdominal CT scanning including the neck, thorax, and abdomen for the evaluation of additional pathologies. These CT scans are reviewed to identify unexpected findings (incidentalomas). Incidentalomas assessed in this study included aortic pathologies (such as calcifications and aneurysms), pulmonary nodules, renal/adrenal masses, and other thoracoabdominal lesions that may affect morbidity or mortality. All CT scans were evaluated by at least two cardiovascular surgeons in collaboration with a board-certified radiologist. Any discrepancies were resolved by consensus to ensure accuracy in identifying and classifying incidental findings.

In terms of surgical planning, it is determined whether these incidentalomas require further preoperative investigations and/or necessitate changes in surgical strategy. Examples of surgical modifications include alterations in cannulation sites, changes in graft selection, or even the complete cancellation of surgery.

Patients were divided into three groups: Group 1: Patients in whom incidentalomas were identified and who underwent further preoperative evaluation and/or surgical plan modification. Group 2: Patients in whom incidentalomas were identified but no additional investigations were performed, and no changes were made to the surgical plan. Group 3: Patients with no incidentalomas detected and no modifications in the surgical plan.

Study Definitions

All patients were monitored for postoperative complications, and this study evaluated only outcomes occurring within the first 30 days after surgery.

Benign incidental findings were defined as lesions detected on preoperative radiological evaluations that were not suspicious for malignancy, did not affect the surgical plan, and did not require further diagnostic work-up. These included simple renal cysts, benign adrenal lesions, benign pulmonary nodules, atheromatous plaques, and mild organomegaly findings considered to have low clinical significance.

Malignant incidental findings were defined as lesions identified on preoperative imaging that were considered suspicious for malignancy, required additional diagnostic evaluation or close follow-up, or necessitated changes in the surgical plan. These included solid pulmonary nodules, adrenal masses with mass-like features, hyper vascular organ lesions, large or irregular renal masses, and suspicious lymph nodes. Additionally, severely calcified aortic pathologies (e.g., porcelain aorta, extensive ascending or aortic arch calcification), significant atherosclerotic plaques, and vascular anomalies likely to complicate surgical intervention were also considered malignant incidental findings.

The new stroke was defined as a permanent brain injury occurring after surgery and confirmed by radiological evaluation. TIA (Transient Ischemic Attack) was defined as a focal neurological deficit due to ischemia of the brain, spinal cord, or retina that resolved completely within 24 hours and showed no signs of acute infarction in imaging studies. Acute renal failure (ARF) refers specifically to patients who require hemodialysis in the postoperative period. Chronic renal failure was defined as an estimated glomerular filtration rate (eGFR) below 30 mL/min/1.73 m^2 or the need for maintenance dialysis. Prolonged ventilation was defined as the need for invasive mechanical ventilation exceeding 24 hours postoperatively. Rehospitalization was defined as readmission to the hospital within 30 days after discharge due to a complication related to the surgical procedure or the same diagnosis. This included readmissions due to postoperative complications, infections, heart failure, arrhythmias, chest pain, or other cardiovascular causes.

Inclusion and Exclusion Criteria

Inclusion criteria: Patients undergoing elective CABG surgery, patients aged 20 years or older, and patients operated via median sternotomy.

Exclusion criteria: Patients with more than 50% occlusion or stenosis in the carotid arteries or those undergoing simultaneous carotid surgery, patients undergoing emergency coronary bypass surgery, patients undergoing additional cardiac procedures alongside CABG, patients with chronic renal failure, patients with a history of previous cardiac surgery or prior surgery involving the descending thoracic or abdominal aorta were excluded to ensure homogeneity of the study population, patients previously diagnosed with cancer, even if complete remission was achieved. These criteria were defined to ensure the homogeneity of the study content and the patient population.

Surgical Protocol and Technique

All patients were operated under general anesthesia via median sternotomy. A central venous catheter was inserted through the jugular vein for central venous access, and arterial blood pressure was monitored through the radial or brachial artery.

All patients received 300 IU/kg of heparin, and after achieving an activated clotting time (ACT)> 400 seconds, aorto-single venous cannulation was performed in patients undergoing cardiopulmonary bypass (CPB), and systemic cooling to 32°C was applied. Cardiac arrest was achieved after cross-clamping using Del Nido cardioplegia along with the application of cold saline slush. Cardioplegia was administered via the antegrade route. Cases operated on a beating heart were not included in this protocol.

Statistical Analysis

Statistical analyses were performed using SPSS version 23.0 (IBM Inc., Chicago, IL, USA). The normality of distribution for continuous variables was assessed using the Shapiro-Wilk test. Variables with normal distribution were reported as mean ± standard deviation (mean ± SD), while non-normally distributed variables were expressed as median (IQR: 25th–75th percentiles). Categorical variables were expressed as frequency and percentage (%) and compared using the Chi-square test or Fisher's exact test.

For comparisons among the three groups, one-way

analysis of variance (ANOVA) was used for normally distributed continuous variables, and the Kruskal-Wallis test was used for non-normally distributed continuous variables and ordinal variables. Post-hoc analyses were conducted for variables with statistically significant differences. Tukey's HSD test was used for post-hoc comparisons of normally distributed variables, while Dunn's test with Bonferroni correction was used for non-normally distributed variables. For categorical variables, pairwise comparisons were performed using the Chi-square test or Fisher's exact test with Bonferroni correction. A *p-value* of *<0.05* was considered statistically significant.

Results

A total of 534 patients were included in the analysis. Based on the presence of incidentalomas and whether surgical planning was altered, patients were categorized into three groups: Group 1 (n=64), Group 2 (n=314), and Group 3 (n=156). The demographic and preoperative clinical characteristics of the patients are summarized in Table I.

Table I. Demographic Characteristics of the Patients

Variable	Group 1 (n:64)	Group 2 (n:314)	Group 3 (n:156)	*p-value*
Sex (male)	47 (73.4%)	255 (81.2%)	118 (75.6%)	*0.211*[a]
Diabetes Mellitus	26 (40.6%)	163 (51.9%)	55 (35.3%)	*0.002*[b]
Chronic Obstructive Pulmonary Disease	10 (15.6%)	51 (16.2%)	8 (5.1%)	0.002[b]
Hypertension	47 (73.4%)	210 (66.9%)	122 (78.2%)	*0.035*[b]
Hypercholesterolemia	41 (64.1%)	212 (67.5%)	83 (53.2%)	*0.010*[b]
Smoking	37 (57.8%)	229 (72.9%)	101 (64.7%)	*0.0262*[b]
Previous Stroke	2 (3.1%)	10 (3.2%)	5 (3.2%)	0.999[a]
Vascular Pathologies	26 (40.6%)	157 (50.0%)	0 (0.0%)	*<0.001*[b]
Urological Pathologies	10 (15.6%)	100 (31.8%)	0 (0.0%)	*<0.001*[b]
Intra-abdominal Pathologies	22 (34.4%)	38 (12.1%)	0 (0.0%)	*<0.001*[b]
Pulmonary Pathologies	25 (39.1%)	19 (6.1%)	0 (0.0%)	<0.001[b]
Cervical Pathologies	6 (9.4%)	6 (1.9%)	0 (0.0%)	*<0.001*[b]
Age	69.00 (60.75-73.25)	64.00 (59.00-69.00)	59.00 (53.00-65.00)	*<0.001*[c]
Body Mass Index	27.26 (24.95-31.34)	29.46 (26.22-32.81)	27.93 (25.61-30.93)	*0.007*[c]
Ejection Fraction (%)	50.00 (40.00-60.00)	60.00 (50.00-60.00)	60.00 (53.75-60.00)	<0.001[c]
Number of total incidentalomas	2.00 (1.00-3.00)	1.00 (1.00-2.00)	0.00 (0.00-0.00)	*<0.001*[c]
Number of benign incidentalomas	1.00 (1.00-2.00)	1.00 (1.00-2.00)	0.00 (0.00-0.00)	*<0.001*[c]
Number of malignant incidentalomas	1.00 (1.00-1.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	*<0.001*[c]

COPD: Chronic Obstructive Pulmonary Disease

[a]: Chi-Square test (number, percentage), [b]:Fisher's Exact Test (number, percentage), [c]: Kruskal-Wallis test (IQR: 25th–75th percentile).

In terms of age, the median age of Group 1 was 69 years (60.75–73.25), which was significantly higher compared to the other groups (*p<0.001*). Post-hoc analysis revealed significant differences between Group 1 and Group 2 (*p=0.003*), Group 1 and Group 3 (*p<0.001*), and Group 2 and Group 3 (*p<0.001*). The distribution of male sex was similar across all groups, with no statistically significant difference observed (*p=0.211*). Regarding body mass index (BMI), patients in Group 2 had significantly higher BMI values compared to the other groups (*p = 0.007*). Post-hoc analysis showed significant differences between Group 1 and Group 2 (*p=0.031*), and between Group 2 and Group 3 (*p=0.007*).

There was a statistically significant difference in the prevalence of diabetes mellitus among the groups (*p=0.002*), with a significant difference observed between Group 2 and Group 3 in post-hoc analysis (*p=0.001*). For chronic obstructive pulmonary disease (COPD), a significant difference was found between groups (*p=0.002*), and post-hoc analysis revealed significant differences between Group 1 and Group 3 (*p=0.021*), and between Group 2 and Group 3 (*p=0.001*). A significant difference was observed among groups in terms of hypertension (*p=0.035*), with a post-hoc difference between Group 2 and Group 3 (*p=0.015*). Hypercholesterolemia also differed significantly among groups (*p=0.010*), with a significant difference between Group 2 and Group 3 (*p=0.003*). A statistically significant difference was observed in smoking history (*p = 0.026*), with a significant post-hoc difference between Group 1 and Group 2 (*p=0.024*).

Left ventricular ejection fraction (EF) was significantly lower in Group 1 compared to other groups (*p<0.001*). Post-hoc analysis confirmed significant differences between Group 1 and Group 2 (*p<0.001*), and between Group 1 and Group 3 (*p<0.001*).

There was a significant difference in the number of unexpected findings among the groups (*p<0.001*). Additionally, other preoperative findings such as vascular, retroperitoneal, intra-abdominal, pulmonary, and cervical pathologies showed significant differences between some of the groups (*p<0.001*).

Table II. Intraoperative and Postoperative Variables

Variable	Group 1 (n:58)	Group 2 (n:314)	Group3 (n:156)	*p-value*
Beating Heart Surgery	34 (58.6%)	15 (4.8%)	18 (11.5%)	*<0.001*[b]
Stroke	1 (1.7%)	4 (1.3%)	2 (1.3%)	*0.961*[a]
TIA	2 (3.4%)	6 (1.9%)	4 (2.6%)	*0.738*[a]
Prolonged ventilation	1 (1.7%)	17 (5.4%)	5 (3.2%)	*0.316*[a]
Pneumonia	3 (5.2%)	20 (6.4%)	9 (5.8%)	*0.924*[a]
Acute renal failure	1 (1.7%)	3 (1.9%)	1 (0.6%)	*0.564*[a]
Mediastinitis	1 (1.7%)	4 (1.3%)	4 (2.6%)	*0.595*[a]
Sepsis	1 (1.7%)	2 (0.6%)	3 (1.9%)	*0.420*[a]
Reoperation	2 (3.4%)	16 (5.1%)	6 (3.8%)	*0.757*[a]
Inotrope use	9 (15.5%)	43 (13.7%)	17 (10.9%)	*0.588*[a]
Pleural effusion	4 (6.9%)	15 (4.8%)	8 (5.1%)	*0.797*[a]
POAF	8 (13.8%)	35 (11.1%)	13 (8.3%)	*0.456*[a]
IABP	3 (5.2%)	10 (3.2%)	4 (2.6%)	*0.629*[a]
Rehospitalization	7 (12.1%)	16 (5.1%)	9 (5.8%)	*0.121*[a]
Mortality	1 (1.7%)	5 (1.6%)	2 (1.3%)	*0.957*[a]
CPB time (minute)	0.00 (0.00-74.50)	84.00 (67.00-103.00)	82.50 (60.00-100.00)	*<0.001*[c]
Cross-clamp time (minute)	0.00 (0.00-62.00)	64.00 (49.00-81.00)	61.50 (44.25-80.00)	*<0.001*[c]
ICU stay (days)	2.00 (2.00-2.00)	2.00 (2.00-2.00)	2.00 (2.00-2.00)	*0.013*[c]
Ward stay after ICU (days)	5.00 (5.00-6.00)	5.00 (5.00-6.00)	5.00 (5.00-6.00)	*0.375*[c]
Total hospital stay (days)	7.00 (7.00-8.00)	7.00 (7.00-8.00)	7.00 (7.00-8.00)	*0.398*[c]
Number of bypass grafts	2.00 (1.00-3.00)	3.00 (2.00-3.00)	3.00 (2.00-3.00)	*<0.001*[c]

TIA = Transient Ischemic Attack; POAF = Postoperative Atrial Fibrillation; IABP = Intra-Aortic Balloon Pump; CPB = Cardiopulmonary Bypass; ICU = Intensive Care Unit.

[a]: Chi-Square test (number, percentage), [b]:Fisher's Exact Test (number, percentage), [c]: Kruskal-Wallis test (IQR: 25th–75th percentile).

Of the 64 patients in Group 1, six were discharged without undergoing surgery due to changes in the surgical plan based on incidentaloma findings. Therefore, postoperative analyses in Group 1 were performed on 58 patients. Analyses in Group 2 and Group 3 included 314 and 156 patients, respectively.

Intraoperative Findings

There were statistically significant differences among the groups regarding CPB time and cross-clamp time (*p<0.001*). Post-hoc analyses revealed that these differences were significant between Group 1 and Group 2 (*p<0.001*), and between Group 1 and Group 3 (*p<0.001*) for both CPB and cross-clamp durations.

Regarding the use of the beating heart surgical technique (off-pump surgery), there were significant differences between groups (*p<0.001*). Post-hoc analysis showed significant differences between Group 1 and Group 2 (*p<0.001*), Group 1 and Group 3 (*p<0.001*), and Group 2 and Group 3 (*p=0.012*). The number of bypass grafts performed also differed significantly among groups (*p<0.001*). Post-hoc analysis indicated significant differences between Group 1 and Group 2 (*p<0.001*), and between Group 1 and Group 3 (*p<0.001*).

Postoperative Findings

There was a statistically significant difference among the groups in terms of intensive care unit (ICU) stay duration (*p=0.013*). Post-hoc analysis showed significant differences between Group 1 and Group 3 (*p=0.011*), and between Group 2 and Group 3 (*p=0.016*).

No statistically significant differences were observed among the groups in terms of stroke, TIA, prolonged ventilation, pneumonia, ARF, mediastinitis, sepsis, reoperation, inotropic support, pleural effusion, postoperative atrial fibrillation (POAF), intra-aortic balloon pump (IABP) usage, total length of hospital stay, rehospitalization, or mortality (*p>0.05*).

In this study, at least one incidentaloma was detected in 70.8% (n=378) of the 534 patients, and in 16.9% of these patients (n=64), the findings led to a change in the surgical strategy. This corresponds to a 12.0% surgical impact rate across the entire population.

Table III. Incidental Findings Detected on Thoracoabdominal CT and Their Distribution Across Groups

			Requiring Additional Diagnostic Workup (Group 1)	Not Requiring Additional Diagnostic Workup (Group 2)
Neck Pathologies 12 (2.24%)	Lymphadenopathy	2 (0.37%)	2 (0.37%)	0 (0%)
	Thyroid pathology	10 (1.87%)	4 (0.74%)	6 (1.12%)
Pulmonary Pathologies 44 (8.23%)	Tracheal Stenosis	1 (0.19%)	1 (0.19%)	0 (0%)
	Benign/Malignant Nodules	14 (2.62%)	14 (2.62%)	0 (0%)
	Emphysema	10 (1.87%)	10 (1.87%)	0 (0%)
	Bronchiectasis	19 (3.55%)	0 (0%)	19 (3.55%)
Abdominal Pathologies 60 (11.23%)	Gastric Malignancy	3 (0.56%)	3 (0.56%)	0 (0%)
	Splenic Atrophy	1 (0.19%)	1 (0.19%)	0 (0%)
	Gallbladder Pathologies	31 (5.80%)	13 (2.43%)	18 (3.37%)
	Hiatal Hernia	2 (0.37%)	0 (0%)	2 (0.37%)
	Liver Pathologies	14 (2.62%)	5 (0.93%)	9 (1.68%)
	Umbilical Hernia	9 (1.68%)	0 (0%)	9 (1.68%)
Urological Pathologies 110 (20.60%)	Renal Cell Carcinoma	1 (0.19%)	1 (0.19%)	0 (0%)
	Adrenal Adenoma	2 (0.37%)	2 (0.37%)	0 (0%)
	Horseshoe Kidney	1(0.19%)	0 (0%)	1 (0.19%)
	Renal Agenesis	4 (0.74%)	4 (0.74%)	0 (0%)
	Renal Stones	24 (4.50%)	0 (0%)	24 (4.50%)
	Renal Cysts	52 (9.73%)	3 (0.56%)	49 (9.17%)
	Prostatic Hypertrophy	26 (4.86%)	0 (0%)	26 (4.86%)
Vascular Pathologies 183 (34.26%)	Aneurysms	32 (6.00%)	3 (0.56%)	29 (5.43%)
	Calcifications	151 (28.27%)	23 (4.30%)	128 (23.97)
	Porcelain Aorta	11 (2.05%)	11 (2.05%)	0 (0%)
	Subclavian Artery Calcifications	3 (0.56%)	3 (0.56%)	0 (0%)
	Iliac Artery Calcifications	9 (1.68%)	9 (1.68%)	0 (0%)

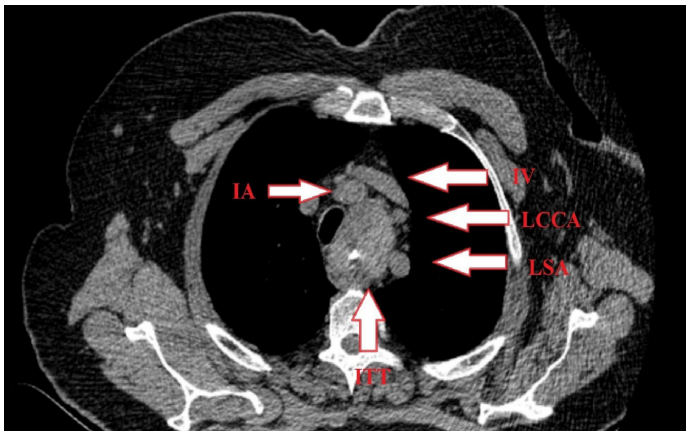
Neck Pathologies

Neck pathologies were identified in 12 patients (2.24%). Of these, 2 patients had lymphadenopathy and 10 had thyroid pathologies. Six patients (2 with lymphadenopathy and 4 with thyroid lesions) required further evaluation and were classified in Group 1, while the remaining 6 patients, who did not require additional assessment, were placed in Group 2. One patient underwent concomitant thyroidectomy during coronary bypass surgery due to a thyroid lesion located adjacent to the aorta (Figure I).

Pulmonary Pathologies

Preoperative CT evaluation revealed pulmonary pathologies in 44 patients (8.23%). One patient with tracheal stenosis was referred to a tertiary center. Fourteen patients had benign or malignant nodules; malignancy was confirmed in one patient following further evaluation, and the patient was discharged (Figure II). Emphysema was detected in ten patients, in whom the lungs were not deflated during surgery. As all of these cases necessitated a change in the surgical plan, they were classified in Group 1. Conversely, 19 patients with bronchiectasis did not require further evaluation and were classified in Group 2.

Figure I. Axial non-contrast thoracoabdominal CT image showing an intrathoracic thyroid lesion (ITT) located adjacent to the innominate artery (IA), innominate vein (IV), left common carotid artery (LCCA), and left subclavian artery (LSA). Due to its proximity to major vascular structures, the lesion was resected via concomitant thyroidectomy during CABG.

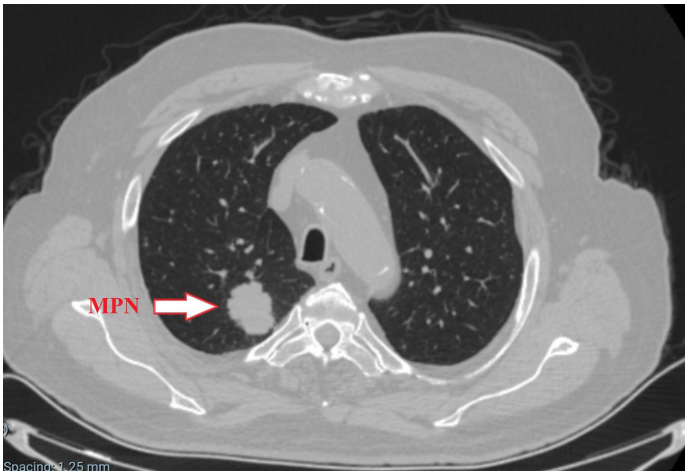


Abdominal Pathologies

Abdominal pathology was detected in 60 patients

(11.23%). Three patients were diagnosed with gastric malignancy, discharged, and referred for medical treatment. One patient with splenic atrophy required further evaluation and was included in Group 1. Gallbladder pathology was found in 31 patients; 13 of these required further investigation and were classified in Group 1, while 18 were classified in Group 2 due to the absence of need for additional evaluation. Hiatal hernia was detected in two patients and umbilical hernia in nine patients; these cases did not require surgical plan changes and were included in Group 2. Liver pathologies were identified in 14 patients; 5 were classified in Group 1 due to the need for further assessment, and 9 in Group 2.

Figure II. Axial non-contrast thoracoabdominal CT image showing a solitary pulmonary lesion (marked as MPN – malignant pulmonary nodule). Malignancy was confirmed through further evaluation, and the patient was discharged without undergoing coronary surgery.



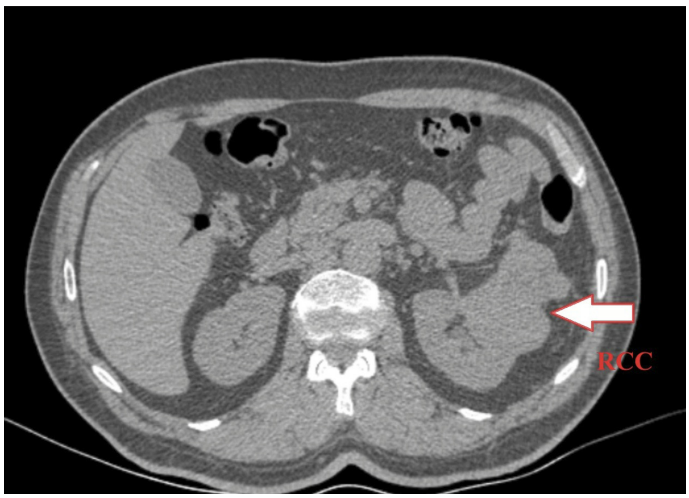
Urological Pathologies

Urological pathologies were found in 110 patients (20.60%). One patient was diagnosed with renal cell carcinoma (RCC) and referred to a tertiary center (Figure III). Two patients had adrenal adenomas, one had a horseshoe kidney, and four had renal agenesis; all were classified in Group 1 due to the need for further evaluation. Renal stones were detected in 24 patients and did not require changes to the surgical plan, so they were placed in Group 2. Renal cysts were found in 52 patients; 3 with multiple cysts requiring further evaluation were included in Group 1, and the remaining 49 were included in Group 2. Additionally, benign prostatic hyperplasia (BPH) was detected in 26 patients, all of whom were included in Group 2, as surgical planning was unaffected.

Vascular Pathologies

Vascular pathology was identified in 183 patients (34.26%). Aneurysmal dilatation was found in 32 patients, and in 3 of these cases, the findings required a change in the surgical plan, classifying them in Group 1. Additionally, vascular calcification was detected in 151 patients (28.27%), of which 23 cases (4.30%) required further evaluation and modifications in surgical strategy, thus classified in Group 1. Among these, porcelain aorta was detected in 11 patients, subclavian artery stenosis in 3, and iliac artery calcification in 9 patients.

Figure III. Axial non-contrast thoracoabdominal CT image showing a solid renal mass (RCC – renal cell carcinoma) in the left kidney. The patient was diagnosed with RCC and referred to a tertiary center for further management.



Discussion

In this study, at least one incidentaloma was detected in 70.8% (n=378) of patients scheduled for elective CABG. Of these findings, 12% (n=64) were considered clinically significant enough to warrant a change in the surgical strategy. The reported prevalence of incidentalomas in the literature varies widely. For example, in the study by Na et al. (86.7%), contrast-enhanced thoracoabdominal CT angiography was used, resulting in a high detection rate (2). In contrast, Park et al. reported a lower incidence (20.1%) using non-contrast chest CT (3). In our study, although non-contrast CT was also used, the scanning area was extended to cover the thoracoabdominal region, which may explain the differences in incidentaloma rates compared to both studies.

In some large series involving TAVI patients,

incidentaloma rates have been reported as high as 85% (8–14). However, these studies typically involve an older patient population and adopt a more extensive imaging approach covering multiple systems. Nevertheless, the use of non-contrast CT in our study may have contributed to a lower detection rate, particularly due to the potential for missing hypervascular lesions. Still, this imaging strategy stands out for its practical applicability and widespread accessibility in real-world clinical settings. Unlike the studies involving TAVI candidates, this study employed non-contrast CT in a younger and more selectively chosen patient population. This distinction may help explain the differences in incidentaloma prevalence.

The clinical impact of CT findings was most evident in the surgical planning process. In total, CT findings led to changes in the surgical plan in 64 patients (12.0%). The most frequent changes included switching to off-pump CABG and re-evaluating graft selection. Furthermore, surgery was canceled in six patients—five due to confirmed malignancies and one due to tracheal stenosis—and these patients were referred to tertiary centers. Similar scenarios have been reported in the literature. In the study by Aviram et al., surgical plans were altered in 6 out of 15 patients, and surgery was canceled in 2 cases (4). Park et al. reported that CT findings directly influenced surgical decisions in 142 patients (50%) (3). In studies involving TAVI patients, such as those by Goitein et al. and Trenkwalder et al., the rates of plan modifications were reported as 23.3% and 25%, respectively (9,11). The relatively lower rate of 12% in our study can be attributed to the more selective patient population and the exclusive use of non-contrast CT.

Extensive aortic calcifications and the presence of a porcelain aorta are significant risk factors in open-heart surgery (5,6,15). In our study, a porcelain aorta was identified in 11 patients, while severe vascular calcifications were observed in others; in the majority of these cases, the surgical approach was revised accordingly. Aviram et al. reported two patients with a porcelain aorta, and in one of them, surgery was canceled (4). Nishi et al. identified circumferential aortic calcification in 4.3% of their patients and noted that the cannulation site was changed in all such cases (5). In Sirin's review, the prevalence of porcelain aorta was reported to range between 2% and 9.3%, and off-pump, no-touch techniques were recommended in these scenarios (6). Similarly, in our study, patients with high-risk aortic pathology were directed toward off-pump surgery in an effort to prevent complications such as stroke.

Beating heart (off-pump) surgery was predominantly performed in patients with severe aortic calcification or porcelain aorta (Group 1). This approach was applied to minimize aortic manipulation and reduce embolic complications. Off-pump surgery was also conducted in other patients with suitable vascular anatomy, even when the surgical plan was not altered. In the study by Park et al., off-pump CABG was performed in 26 of 36 patients with severe aortic atherosclerosis (3). In the study by Na et al., anaortic off-pump CABG was performed in 64 of 66 patients with significant aortic calcification (2). These findings underscore the importance of preoperative CT in identifying high-risk patients and guiding the selection of an appropriate surgical technique.

Vascular calcification was not limited to the aorta but also provided critical information regarding peripheral arteries. In our study, significant calcification in the proximal segment of the left subclavian artery was observed in three patients, while diffuse iliac artery calcification was detected in nine. These findings directly influenced both graft selection and the need for potential postoperative support. In patients with subclavian artery calcification, the left internal thoracic artery (LITA) graft was generally used as a free graft or replaced with alternative grafting strategies. Furthermore, in cases of iliac artery calcification where IABP applicability was limited, preoperative assessment of peripheral arteries became a critical part of the surgical strategy. Similar findings in previous studies have also been shown to affect surgical planning (2,3). Sirin's review indicated that in cases of subclavian artery stenosis, the use of LITA grafts may still be feasible after preoperative stenting (6).

In our study, the 30-day mortality rate remained low, with no statistically significant differences observed between the groups. Even in the highest-risk group,

the mortality rate was comparable to that of the other groups. This finding suggests that CT-based risk assessment may be effective in anticipating and preventing complications. In the study by Park et al., the mortality rate reached up to 30% in patients with severe aortic atherosclerosis who did not undergo off-pump strategies (3). Similarly, Na et al. reported that a patient diagnosed with malignancy died without undergoing surgery (2). Other studies have indicated that excluding patients from surgery based on CT findings reduced the risk of stroke and mortality (5,15). TAVI-related studies further support this perspective; for instance, Trenkwalder et al. reported that clinically significant incidental findings could alter treatment planning without increasing mortality, while Markowiak et al. emphasized that certain CT findings might negatively affect long-term survival (11,12).

In our study, some patients with suspected malignancies were referred for further evaluation, including MRI, PET, or biopsy, and once the diagnosis was confirmed, five patients were not operated on and were referred to relevant specialties. Identified malignancies included lung cancer, gastric tumors, and renal cell carcinoma. Similar rates have been reported in the literature. In the study by Park et al., malignancy was detected in 8 patients (2.8%), and some underwent concurrent resections (3). Na et al. reported that one patient died due to advanced gastric cancer, while another underwent pulmonary lobectomy following CABG (2). TAVI studies have also reported substantial malignancy rates: Stachon et al. identified suspected malignancies in 18.7% of patients, while Bianchi et al. reported high-risk lesions in 15% of cases (8,14). Goitein et al. and Hussien et al. reported malignancy rates of 4.4% and 3.3%, respectively (9,10). In the study by Tobe et al., significant incidental findings were identified in 13.2% of Japanese TAVI candidates, and six patients were diagnosed with malignancies (13). These findings collectively indicate that preoperative CT can serve as an effective tool not only for anatomical assessment but also for systemic screening. In our study, early identification of suspicious lesions ensured patient safety and allowed for more predictable surgical planning.

This approach is also in line with the current recommendations of the 2023 AHA/ACC Guideline for Coronary Artery Disease. The guideline emphasizes the importance of comprehensive evaluation before surgical revascularization, considering comorbid conditions and balancing risks and benefits in surgical planning (1). The use of preoperative CT screening in our study provided results that are consistent with these principles in both surgical strategy and systemic assessment. Based on these findings, routine use of thoracoabdominal CT screening in elderly patients and those with comorbidities who are candidates for CABG should be considered.

This study has several limitations. First, all evaluations were based solely on non-contrast thoracoabdominal CT scans. This may have led to the omission of certain pathologies, especially hypervascular lesions that could be more clearly identified with contrast-enhanced imaging. However, the widespread availability, lower cost, and practical nature of non-contrast CT increase its applicability under real-world conditions. Second, the single-center, retrospective design of the study may limit the generalizability of the findings. Prospective studies conducted across multiple centers with diverse patient populations are needed to validate these results on a broader scale.

Third, the long-term clinical outcomes associated with incidental findings detected on CT were not assessed within the scope of this study. Further investigations are required to determine the potential effects of these findings on long-term mortality, morbidity, and quality of life. Additionally, some of the incidental pulmonary findings, such as ground-glass opacities, may have been related to prior COVID-19 infection, particularly since the study period overlaps with the pandemic years. Differentiating such post-infectious changes from other causes was beyond the scope of this retrospective analysis. Lastly, some incidental findings could not be pathologically confirmed, and assessments were based on clinical and radiological follow-up. This may have led to uncertainty in determining the true nature of certain lesions. Despite these limitations, our study clearly demonstrates the value of non-contrast thoracoabdominal CT in the preoperative assessment

of patients undergoing elective CABG.

Conclusion

This study demonstrated that preoperative non-contrast thoracoabdominal CT scanning provided significant contributions to surgical planning in patients scheduled for elective CABG. The early identification of high-risk conditions such as porcelain aorta, extensive vascular calcifications, and malignancies enabled strategic decisions, including the preference for off-pump surgery, appropriate graft selection, and, when necessary, cancellation of the operation. These measures contributed to the reduction of complications and resulted in low mortality rates. Non-contrast CT emerges as both a safe and accessible modality, offering not only anatomical but also systemic evaluation, thus serving as a valuable tool in surgical planning.

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