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Fully robotic coronary revascularization: A new era in cardiovascular medicine

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Hybrid coronary revascularization has been proven to be an attractive method of treatment of chronic coronary syndromes, especially in patients for percutaneous revascularisation of the left anterior descending artery is related to a higher risk of long-term failure and good accessibility of other vessels for percutaneous coronary intervention [1]. Robotics development has led to the introduction of robotic coronary artery bypass grafting and percutaneous coronary intervention (R-PCI). The first device allows for smaller incisions, resulting in lesser surgical trauma, directly leading to better and reduced rib manipulations and elevation, which is the main reason for pain in MIDCAB patients. The latter device allows the operator to perform stenting with necessary precision while significantly reducing the radiation dose received during the procedure and reducing other occupational risks for interventional cardiologists [2].

A 77-year-old female patient was admitted to our Department. The patient was referred to as multivessel disease and suffered from Canadian Cardiovascular Society class III angina (CCS 3). The comorbidities included hypertension, renal failure, diabetes mellitus type II, myasthenia gravis, and extrapyramidal syndrome. Angiography revealed the left main disease and intermediate lesions in left anterior descending artery and cimcumflex, but RCA was occluded. Local Heart Team discussion led to the decision of hybrid coronary revascularization,

and considering numerous comorbidities, anatomy of coronary vessels, and location of lesions, a decision was made to perform a single-stage hybrid procedure using robotic modalities.

The patient was admitted to a hybrid operating room, temporarily equipped with the Da Vinci Xi surgical system (Intuitive Surgical, Sunnyvale, CA, US) and R-One platform (Robocath Co, France) (Figure 1). The patient was sedated in general anesthesia and intubated with a double lumen endotracheal tube. The left internal mammary artery (LIMA) was harvested using bipolar microforceps and a monopolar spatula. Pericardiectomy was performed with the use of the robot to expose LAD in the desirable location. Bypass grafting was performed through a small left-sided thoracotomy. LIMA-LAD anastomosis was performed with an 8-0 running suture.

In the second stage, percutaneous intervention was performed. The R-one device was placed on the patient's left side and mounted alongside the Da Vinci Xi surgical arms. During the procedure, the cardiologist was located in the adjacent room and provided complete control over fluoroscopy, C-arm, operating table, stents, balloons, and guidewires. The left main toward the circumflex artery was a target for the procedure. After wiring of Cx, serial dilatation was performed, followed by drug-eluting stent — Ultimaster Tansei 3.5 × 18 (Terumo Co, Japan) with subsequent post-dilatation within the left main. Additional Ultimaster Tansei stent 3.0 × 12 mm was placed distally. TIMI 3 blood flow had been restored within the targeted arteries.

The patient was extubated quickly, and chest drainage was 300 ml. The patient was discharged home after 72 hours without signs of inflammation, a stable hemoglobin level, and no surgical site-related pain. Double antiplatelet therapy was initiated before surgery and PCI (according to local standards) and continued for 6 months after the procedure. No major adverse cardiac events were reported at the 12-month follow-up.

Robotics in cardiovascular medicine is being used for different applications [3, 4], but not for complex, complete revascularization that was presented in this case. It is a very promising option that should be introduced widely in the future.

Article information

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REFERENCES

1. Moreno PR, Stone GW, Gonzalez-Lengua CA, et al. The hybrid coronary approach for optimal revascularization: JACC review topic of the week. J Am Coll Cardiol. 2020; 76(3): 321–333, doi: 10.1016/j.jacc.2020.04.078, indexed in Pubmed: 32674795.
2. Wagener M, Onuma Y, Sharif R, et al. Features and limitations of robotically assisted percutaneous coronary intervention (R-PCI): a systematic review of R-PCI. J Clin Med. 2024; 13(18), doi: 10.3390/jcm13185537, indexed in Pubmed: 39337024.
3. Zelias A, Khokhar AA, Proniewska K, et al. Percutaneous coronary intervention of a tortuous and complex circumflex lesion using the robotic CorPath GRX system. Kardiol Pol. 2021; 79(9): 1044–1045, doi: 10.33963/KP.a2021.0057, indexed in Pubmed: 34231872.
4. Suwalski P, Stec S, Zienciuk-Krajka A. Robotic bilateral cardiac sympathetic denervation in a patient with severe long QT syndrome: First experience in Poland. Kardiol Pol. 2023; 81(6): 644–645, doi: 10.33963/kp.a2023.0097.

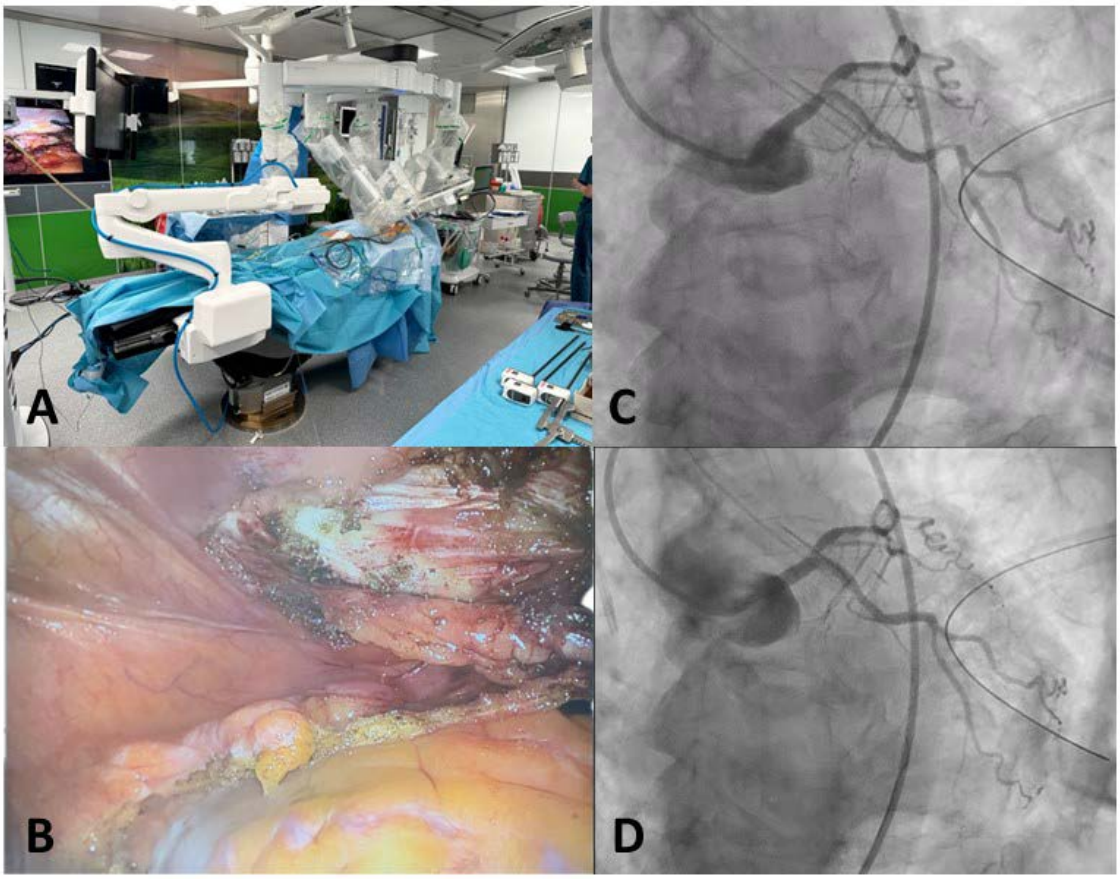

Figure 1. **A.** Operating hybrid room set-up with two robots in place. **B.** In-surgery photo of LIMA harvesting. **C.** Coronary angiography before stenting. **D.** Coronary angiography after stenting