

Zajecar invasive cardiology department during the period of 2014 to 2024

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Abstract

Background. The aim of this work is to present the results of the Department of Invasive Cardiology in Zaječar from 2014 to 2024.

Methods. Between 2014 and 2024, 7,157 procedures were performed, including 4,775 (66.71%) coronary angiographies and 2,382 (33.29%) PCI procedures. Since June 26, 2015, the primary vascular approach has been the right radial, with femoral used only as an alternative.

Results. The number of coronary angiographies was 188 in 2014, 470 in 2015, 416 in 2016, 502 in 2017, 328 in 2018, 561 in 2019, and 494 in 2020, 484 in 2021, 706 in 2022, and 626 in 2023. The number of PCI procedures also increased, from 36 in 2014 (19% of all diagnoses), to 159 (33%) in 2015, 173 (41%) in 2016, 253 (50%) in 2017, 174 (53%) in 2018, 372 (66%) in 2019, 297 (60%) in 2020, 292 (60%) in 2021, 343 (48%) in 2022, and 283 (45%) in 2023. The number of stents used per procedure was analyzed: 47 in 2014 (1.3 per procedure), 183 (1.1 per procedure) in 2015, 210 (1.2 per procedure) in 2016, 334 (1.3 per procedure) in 2017, 237 (1.3 per procedure) in 2018, 395 (1 per procedure) in 2019, 409 (1.3 per procedure) in 2020, 422 (1.4 per procedure) in 2021, 554 (1.6 per procedure) in 2022, and 725 (2.5 per procedure) in 2023.

The outcomes of treatment were analyzed, including the ratio of number of patients indicated for optimal medication therapy (OMT), (normal angiographic results), to those who underwent PCI, or were referred for CABG (the most complex cases). Medication therapy was recommended for 77 (41%) patients and PCI was performed in 57 (30%) patients in 2014, for 180 (38%) OMT and 163 (35%) PCI in 2015, for 171 (41%) OMT and 177 (43%) with PCI in 2016. In 2017, 153 (30%) were treated with OMT and 256 (51%) with PCI; in 2018, 107 (33%) and 175 (53%); in 2019, 175 (31%) and 318 (57%); in 2020, 150 (32%) with OMT and 267 (56%) with PCI; in 2021, 137 (30%) with OMT and 258 (57%) with PCI; in 2022, 204 (30%) with OMT and 369 (54%) with PCI; and in 2023, 213 (33%) with OMT and 345 (54%) with PCI.

Arterial access was femoral in 188 (100%) patients in 2014, 306 (65%) femoral and 164 (35%) radial in 2015, 59 (15%) femoral and 357 (85%) radial in 2016, 447 (89%) radial and 55 (11%) femoral in 2017, 296 (90%) radial and 32 (10%) femoral in 2018, 529 (94%) radial and 32 (6%) femoral in 2019, 476 (96%) radial and 18 (4%) femoral in 2020, 469 (97%) radial and 15 (3%) femoral in 2021, 676 (96%) radial and 30 (4%) femoral in 2022, and 601 (96%) radial and 25 (4%) femoral in 2023.

Conclusion. In the first ten years of operation, the Department of Invasive Cardiology in Zaječar organized a 24/7 readiness for treating patients with acute coronary syndrome. Thanks to this organization, more than half of the treated patients had acute coronary syndrome and were treated with primary PCI. The last seven years show a constant increase in the number of PCI procedures, and a reduction in the number of patients referred for cardiac surgery consultations, and an increase in the number of stents used due to more complex procedures and the treatment of multivessel coronary disease in the same procedure.

Key words Zajecar invasive cardiology, coronary angiography, radial access, percutaneous coronary intervention

Introduction

The Department of Invasive Cardiology in Zaječar was established in 2014 as part of the network for the regionalization of angiography cath labs in Serbia. It was founded on the same foundation of the Pacemaker Center, which has existed in Zaječar since 2008. The Department of Invasive Cardiology in Zaječar treats all patients with coronary artery

disease from the eastern part of Serbia, which includes the Bor and Zaječar districts, each consisting of four municipalities. The use of percutaneous coronary intervention (PCI) in acute myocardial infarction with ST elevation (STEMI) is unequivocal and well-known over the last few decades, with mortality reduction to 4.5%. In recent years, an increasing number of patients with non-ST elevation myocardial infarction (NSTEMI) are being treated with PCI, either on the first day or, in the

majority of cases, during the same hospitalization. With the expansion of the indication criteria, the number of patients with all forms of acute coronary syndrome (ACS) treated in the cath lab has significantly increased. Since 2016, as part of the STEMI network of the Republic of Serbia, the Department of Invasive Cardiology in Zaječar has treated all ACS patients from eastern Serbia, 7 days a week, 24 hours a day, 365 days a year.

The aim of this work is to present the results of the Department of Invasive Cardiology in Zaječar from 2014 to 2024.

Methods

Between 2014 and 2024, a total of 7157 procedures were performed, including 4775 (66.71%) coronary angiographies and 2382 (33.29%) PCI procedures. Since June 26, 2015, the primary access has been the right radial access, with femoral artery access used only as an alternative. The Department of Invasive Cardiology in Zaječar uses a Siemens Axiom Artis X-ray machine. Coronary angiographies and PCI procedures were performed using right-sided radial artery access or right sided femoral access. A 6F, 11 cm introducer with a dilator and hemostatic valve was used. For cannulation of the left coronary artery, TIG 3.5, JL 3.5, and 4 coronary catheters or guiding catheters EBU 3.5 or 3.75, JL 4 was used. For cannulation of the right coronary artery, TIG 3.5, JR 3.5, and 4 coronary catheters or guiding catheters JR 3.5 and 4 were used. Visualization of the left anterior descending artery (LAD) was performed in RAO cranial or PA cranial projections. Visualization of the circumflex artery (Cx) was performed in PA caudal and RAO caudal projections. Visualization of the right coronary artery (RCA) was performed in LAO or PA cranial projections.

Results

The number of coronary angiographies was 188 in 2014, 470 in 2015, 416 in 2016, 502 in 2017, 328 in 2018, 561 in 2019, and 494 in 2020, 484 in 2021, 706 in 2022, and 626 in 2023. The number of PCI procedures also increased, from 36 in 2014 (19% of all diagnoses), to 159 (33%) in 2015, 173 (41%) in 2016, 253 (50%) in 2017, 174 (53%) in 2018, 372 (66%) in 2019, 297 (60%) in 2020, 292 (60%) in 2021, 343 (48%) in 2022, and 283 (45%) in 2023. The number of stents used was analyzed: 47 in 2014 (1.3 per procedure), 183 (1.1 per procedure) in 2015, 210 (1.2 per procedure) in 2016, 334 (1.3 per procedure) in 2017, 237 (1.3 per procedure) in 2018, 395 (1 per procedure) in 2019, 409 (1.3 per procedure) in 2020, 422 (1.4 per procedure) in 2021, 554 (1.6 per procedure) in 2022, and 725 (2.5 per procedure) in 2023 (Table 1).

The treatment outcomes were analyzed, including the number of patients for whom OMT therapy was recom-

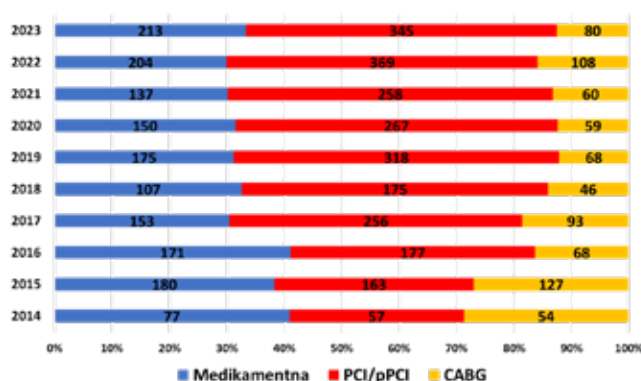


Figure 1. Treatment outcomes during the 2014-2023 period



Figure 2. Radial vs femoral access during the period of 2014-2023

mended (normal angiographic findings), compared to those who underwent PCI, or were referred for CABG (the most complex cases). OMT was recommended for 77 (41%) patients, and PCI was performed in 57 (30%) patients in 2014. In 2015, OMT was recommended for 180 (38%) patients, and PCI was performed in 163 (35%). In 2016, 171 (41%) patients were treated with OMT, and 177 (43%) with PCI. In 2017, 153 (30%) patients were treated with medication, and 256 (51%) with PCI; in 2018, 107 (33%) with OMT, and 175 (53%) with PCI; in 2019, 175 (31%) with OMT, and 318 (57%) with PCI. In 2020, 150 (32%) patients were treated with OMT, and 267 (56%) with PCI; in 2021, 137 (30%) with OMT, and 258 (57%) with PCI; in 2022, 204 (30%) with OMT, and 369 (54%) with PCI; and in 2023, 213 (33%) were treated with OMT, and 345 (54%) with PCI (Figure 1).

The arterial access was femoral in 188 (100%) patients in 2014, 306 (65%) femoral and 164 (35%) radial in 2015, 59 (15%) femoral and 357 (85%) radial in 2016. In 2017, 447 (89%) had radial access, and 55 (11%) had femoral access; in 2018, 296 (90%) had radial access, and 32 (10%) had femoral access. In 2019, 529 (94%) had radial access, and 32 (6%) had femoral access; in 2020, 476 (96%) had radial access, and 18 (4%) had femoral access; in 2021, 469 (97%) had radial access, and 15 (3%) had femoral access; in 2022, 676 (96%) had radial access, and 30 (4%) had femoral access. Radial access was used in 601 (96%) and femoral access in 25 (4%) patients (Figure 2).

Table 1. Analysis of the results during the 2014-2023 period

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Koro	188	470	416	502	328	561	494	484	706	626
PCI	36 (19%)	159 (33%)	173 (41%)	253 (50%)	174 (53%)	372 (66%)	297 (60%)	292 (60%)	343 (48%)	283 (45%)
Stentovi	47 (1,3)	183 (1,1)	210 (1,2)	334 (1,3)	237 (1,3)	395 (1,0)	409 (1,3)	422 (1,4)	554 (1,6)	725 (2,5)

Discussion

The Department of Invasive Cardiology in Zaječar has experienced a constant increase in the number of patients from the territory of Eastern Serbia, from 188 patients in the first year to 706 in 2022, which remains the year with the highest number of procedures. The only deviations from this trend occurred in 2014, as expected, being the first year of operation, and in 2018, when the number of procedures presented was for only for 6 months, as our cath lab was out of service for the remainder of the year due to equipment malfunction. The number of procedures has stabilized and indicates that in Eastern Serbia, we can project around 500 coronary angiograms annually, of which approximately 300 require PCI as a treatment modality⁴.

A significant increase in the number of patients treated with percutaneous coronary intervention (PCI) and stent implantation is observed, from 47 in the first year to 725 implanted stents in 2023. Four parameters that were monitored can be used to assess the quality of work and the professional maturity of the angiography team. The first is the consistent percentage of around 30% of patients in the last seven years who had normal coronary angiography results or lesions that did not require a percutaneous intervention. This reflects proper patient triaging and the fact that the decision to intervene and the indication for PCI is made solely by the angiography team physicians, with this percentage remaining unchanged for the last 7 years.

The second parameter is the increase in the number of procedures, from 30% of examined patients in the first three years to over 50% in the last seven years, showing a steady rise. The third parameter is the reduction in the percentage of patients referred to the cardiovascular surgery team, from 30% in the early years to a constant 15% in the last seven years. This reduction is due to the increasing number of PCI interventions performed. The fourth parameter is the increase in the number of stents per procedure, which went from 1.1 stents in the first years to 2.5 stents per procedure in 2023. This indicates that a greater number of complex procedures are being performed, with more stents, more bifurcation techniques, and more frequent decisions to perform PCI on two or three coronary arteries in a single procedure. We are particularly proud of the fact that, throughout the years of operation, approximately 50% of the patients treated interventionaly in our department were

those with some form of acute coronary syndrome (ACS) (Chart 2). In the United Kingdom and Europe, there are 3300 diagnostic procedures per million inhabitants and 1500 procedures with any form of revascularization per million inhabitants^{5,6}.

Another parameter of the professional maturation of the angiography team is the arterial access. Initially, femoral arterial access was used in the first year and the first half of 2015, but it quickly shifted to radial access, which became the primary approach for every procedure, with the rate rising to over 80% by the second year of radial access implementation, and staying over 95% in all subsequent years.

Conclusions

In the first ten years of operation, the Department of Invasive Cardiology in Zaječar has organized 24/7 readiness for the treatment of patients with acute coronary syndrome. Thanks to this organization, more than half of the treated patients had acute coronary syndrome and were treated using interventional methods. The last seven years show a constant increase in the number of PCI procedures, corresponding to a reduction in the number of patients referred to the Cardiovascular Surgery Consult, as well as an increase in the number of stents due to more complex procedures and the treatment of multi-vessel coronary disease in a single procedure.

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Sažetak

Odeljenje invazivne kardiologije u Zaječaru u periodu 2014-2024.

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Odeljenje invazivne kardiologije, ZC Zaječar

Uvod. Cilj rada je prikaz rezultata rada Odeljenja invazivne kardiologije u Zaječaru, u periodu od 2014. do 2024. godine.

Metodi. U periodu od 2014. do 2024. godine urađeno je 7157 procedura, 4775 (66,71%) koronarografija i 2382 (33,29%) PCI procedura. Od 26.juna 2015. godine prvi pristup je punkcija desne radijalne arterije a punkcija femoralne arterije se koristi kao alternativni pristup.

Rezultati. Broj koronarografija je bio 188 u 2014. godini, 470 u 2015. godini, 416 u 2016. godini, 502 u 2017. godini i 328 u 2018. godini, 561 u 2019. godini i 494 u 2020. godini, 484 u 2021. godini, 706 u 2022. godini i 626 u 2023. godini. Povećavao se i broj PCI procedura od 36 u 2014 ili 19% od svih dijagnostikovanih, 159 ili 33% u 2015. godini, 173 ili 41% u 2016., 253 ili 50% u 2017. 174 ili 53% u 2018., 372 ili 66% u 2019., 297 ili 60% 2020., 292 60% u 2021., 343 48% u 2022. 283 (45%) u 2023. godini. Analiziran je broj stentova 47 u 2014. godini ili 1,3 po proceduri, 183 ili 1,1 po proceduri u 2015., 210 ili 1,2 po proceduri u 2016., 334 ili 1,3 po proceduri u 2017., 237 ili 1,3 po proceduri u 2018. godini, 395 ili 1 po proceduri u 2019., 409 ili 1,3 po proceduri u 2020. i 422 ili 1,4 u 2021., 554 ili 1,6 po proceduri u 2022. i 725 ili 2,5 stentova po proceduri u 2023. godini. Analiziran je odnos ishoda lečenja, kod koliko pacijenata je predložena medikamentna terapija (normalan angiografski nalaz), kod kojih je urađena PCI ili su upućeni na CABG (najkompleksniji pacijenti). Medikamentna terapija je preložena kod 77 (41%), a PCI urađen kod 57 (30%) pts u 2014. godini, kod 180 (38%) medikamentna terapija i PCI kod 163 (35%) u 2015. 171 (41%) medikamentno tretirani i 177 (43%) sa PCI u 2016. godini. U 2017. 153 (30%) medikamentno i 256 (51%) lečeni PCI, u 2018. 107 (33%) i 175 (53%), u 2019. 175 (31%) i 318 (57%) lečenih pts. U 2020. 150 (32%) medikamentno tretirani i 267 (56%) PCI tretirani, u 2021. 137 (30%) i 258 (57%), u 2022. 204 (30%) i 369 (54%) i u 2023. medikamentno su tretirani 213 (33%) i PCI tretirani 345 (54%). Arterijski pristup je bio kod 188 (100%) pts femoralni u 2014. godini, 306 (65%) femoralni i 164 (35%) u 2015., 59 (15%) femoralni i 357 (85%) radijalni u 2016. U 2017. 447 (89%) radijalni i 55 (11%) femoralni pristup, u 2018. 296 (90%) radijalni i 32 (10%) femoralni. U 2019. godini bilo je 529 (94%) sa radijalnim i 32 (6%) sa femoralnim pristupom, 2020. 476 (96%) radijalni i 18 (4%) femoralni., 2021. 469 (97%) radijalni i 15 (3%) femoralni, 2022. 676 (96%) radijalni i 30 (4%) femoralni. Radijalni pristup je bio kod 601 (96%), i femoralni kod 25 (4%) pacijenata.

Zaključak. U prvih deset godina rada u Odeljenju Invazivne kardiologije u Zaječaru organizovana je pripravnost 24/7 za lečenje pacijenata sa akutnim koronarnim sindromom. Zahvaljujući ovoj organizaciji više od polovine lečenih pacijenata bili su sa akutnim koronarnim sindromom i lečeni su interventnim metodama. Poslednji sedam godina pokazuje na konstantni porast broja PCI procedura na račun smanjenja broja pacijenata koji se upućuju na Kardiohirurški konzilijum kao i povećanjem broja stentova na račun kompleksnijih procedura i tretiranjem visesudovne koronarne bolesti u istom aktu.

Ključne reči: Zdravstveni centar Zaječar, koronarografija, radijalni pristup, perkutana koronarna intervencija