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Original research article

Impact of radial and femoral access on radiation dose and fluorography time in patients with acute coronary syndrome

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ARTICLE INFO

Article history:

Received 22 October 2017

Received in revised form

6 November 2017

Accepted 10 November 2017

Available online xxx

Keywords:

Coronary intervention

Radiation dose

Fluorography time

Acute coronary syndrome

ABSTRACT

Background: Current guidelines favor radial over femoral access in patients with acute coronary syndromes for safety according to the results of recent trials. However, influence of access site on radiation dose and fluorography time is still unclear.

Methods: We retrospectively analyzed 390 patients who underwent percutaneous coronary intervention for acute coronary syndrome in Kardiocentrum Vysočina. We compared the access site with the number of stents implanted, the average fluorography time in minutes, the average radiation dose and mean effective dose that each patient received in Gy/cm² or mSv respectively.

Results: Use of femoral access resulted in approximately 11% lower radiation dose ($p = 0.03$). There has been no significant difference between fluorography time and the number of stents implanted in both cohorts.

Conclusion: We found that the radiation dose was lower in femorally accessed group. Although radiation dose is not the main concern in patients with acute coronary syndromes, our results suggest that femoral access can be preferred over radial access in certain situations.

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Introduction

Percutaneous coronary intervention in patients with acute coronary syndrome has been well established in the cardiologic therapeutic process for many years. Historically, interventions have been performed via femoral access due to operator orientated conditions. Interventional equipment did

not offer alternative options in early days and interventions were performed on patients with severe atherosclerosis [1]. All interventional cardiologist were trained for femoral access and this way of intervention was considered as the gold standard of coronary interventions.

However, recent introduction of new sheaths, guiding catheters and wires allowed for coronary interventions to be

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<https://doi.org/10.1016/j.crvasa.2017.11.004>

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performed by radial access. The advantage of this approach is that it is patient orientated. Radial access offers easier compression of the artery, earlier mobilization of the patient [2] and even reduced time and the number of hospitalizations [3]. This resulted in an increased amount of interventions performed via radial access and many operators feel more comfortable with this way of intervention nowadays.

It is commonly accepted that femoral access is easier and faster for operators but leads to more frequent complications in patients. On the other hand, radial access is considered as more complicated for the operator but results in fewer post administration procedural complications [4]. In this study we therefore addressed this issue. Using retrospective data from patients with acute coronary syndromes we tested whether the increased number of radial interventions may have influenced the fluorography time or radiation dose administered compared to femorally accessed interventions.

Material and methods

Patients

In total, data from 390 patients that underwent coronary intervention for acute coronary syndrome in Kardiocentrum Vysočina in two periods were analyzed. First period was from January to September 2011 when coronary interventions were performed via femoral access. Second period was from January to September 2017 when patients were intervened via radial access. Specifically, 194 patients were subjected to radial and 196 to femoral route of intervention. To reduce amount of selection bias, for example that femoral access would be preferred in patients with severe atherosclerosis, we analyzed the number of stents that were implanted during interventions in both groups. Patients who required a switch from radial to femoral access or vice versa during the intervention were excluded from this analysis.

Coronary interventions and operators

All three operators work in continuous service, all of them perform at least 700 coronary angiographies per year and performed at least 3000 coronary angiographies before start of this analysis. All procedures were performed with a Phillips Integris Alura 10F image intensifier system. The system was set to pulsed fluoroscopy at 10 pulses per second and cine acquisition at 15 frames per second. Diameter of image intensifier of 20 cm was used for all patients with appropriate collimation. We included only those patients who were intervened via superficial or common femoral artery and left or right radial artery. Patients with coronary artery bypass grafts from left internal mammary artery to left anterior

descending artery underwent procedure via left radial access or via femoral artery access.

Collected data

Administered radiation dose in Gy/cm² and average fluorography time in minutes was compared as a specific parameter for each route of intervention. Patient mean effective dose in miliSieverts (mSv) was estimated as radiation dose in Gy/cm² multiplied by conversion factor of 0.2 [5] and the effective doses were compared with current recommendations of European Society of Cardiology [6].

Statistical analysis

Data were compared by Student's t-test using Statistica v.9.1 software (StatSoft Inc., Tulsa, USA). Differences with $p < 0.05$ were considered as significant.

Results

Patients

In total, 390 patients were examined in both cohorts. Within this group, 196 patients (50.3%) underwent coronary intervention via femoral access and 194 patients (49.7%) underwent coronary intervention via radial access.

Coronary interventions

The average radiation dose was 58.13 Gy/cm² in radially accessed patients and 51.57 Gy/cm² in femorally accessed patients. This corresponds with patient mean effective dose of 11.63 mSv and 10.31 mSv, respectively. The average fluorography time was 6.83 min for radial access and 6.89 min for femoral access. The average number of stents was 1.32 in radial access group and 1.39 in femoral access group. Despite minor numerical differences, the number of stents or fluorography time did not significantly differed in both cohorts (Table 1). However, radiation dose was significantly lower in femorally accessed group than in radially accessed patients ($p = 0.03$).

Discussion

In this study we compared fluorography time and radiation dose in patients with acute coronary syndrome who underwent percutaneous coronary interventions. Using the protocol with femoral access makes the catheter more stable and the operator is further from the image intensifier. In the addition,

Table 1 – Radiation dose, fluorography time and number of stents in radially and femorally accessed patients.

Intervention	Radiation dose (Gy/cm ²)	Effective radiation dose (mSv)	Fluorography time (min)	Number of stents
Femoral	51.57 ± 29.86*	10.31 ± 5.97*	6.88 ± 4.95	1.38 ± 0.64
Radial	58.12 ± 31.96	11.62 ± 6.39	6.83 ± 3.81	1.32 ± 0.56

* $p = 0.03$ when femoral and radial access was compared.

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