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Radiation Dosage for Percutaneous PAD Treatment is Different in Cardiovascular Disciplines: Results From an Eleven Year Population Based Registry in the Metropolitan Area of Hamburg

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WHAT THIS PAPER ADDS

This is the first large population based study on radiation dosage for endovascular revascularisation (ER) for peripheral artery disease (PAD). Median dose area product (DAP) was lower in women and patients of higher age. In addition, significant differences were seen between disciplines conducting the procedures. The lowest DAP was seen in procedures conducted by vascular surgeons and following multidisciplinary consensus. As there is good evidence for the risk of stochastic effects leading to radiation induced malignancy, these results emphasise the importance of developing preventive strategies and the need for future studies targeting the reasons for evident differences.

Objective: The worldwide prevalence of peripheral artery disease (PAD) has evolved to an intervention as the primary treatment option and therefore radiation is used with escalating incidence. Dose area product (DAP) correlates well with the total energy imparted to the patient during fluoroscopic interventions. This study aims to determine whether there are any associations among stage of disease, gender, age, and expertise on the radiation dose in single endovascular treatments of PAD.

Methods: This study was a prospective, mandatory, population based cross-sectional registry design. In total, 24,000 invasive percutaneous endovascular treatments of PAD conducted in the metropolitan area of Hamburg (Germany) were consecutively collected between January 2004 and December 2015. DAP was analysed by discipline conducting the procedure, Fontaine classification, patient gender, and age.

Results: Statistically significant differences in median DAP values were found. The lowest median DAP values were observed in surgical centres (7.1 vs. 18.0 Gy*cm^2, $p<.001$) and in endovascular revascularisations (ER) following multidisciplinary consultation (11.6 vs. 23.4 Gy*cm^2, $p<.001$). Considering the treatment of intermittent claudication, men had statistically significantly higher DAP values compared with women. Furthermore, lower median DAP values were observed in higher age groups, with lowest dosages in octogenarians.

Conclusion: This is the first large population based study on DAP during ER for PAD. Several significant differences in median DAP values were observed, although patient stratification was comparable. Pre-operative therapy strategy planning can lead to lower DAP values, emphasising the importance of further vascular research and quality improvement projects targeting this topic. To date, available evidence is limited and therefore there is no accepted range of DAP levels. However, the ever increasing use of fluoroscopic interventions means that further investigation into radiation exposure to patients and healthcare professionals is required in order to keep DAP levels low.

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INTRODUCTION

Peripheral artery disease (PAD) has become a global problem with a significant impact on national healthcare systems. In recent years, the prevalence of PAD has increased in many countries. A recent systematic review detected approximately 202 million people living with PAD worldwide.[1] In Germany, endovascular revascularisations (ER), especially for critical limb ischaemia (CLI), increased by 46%

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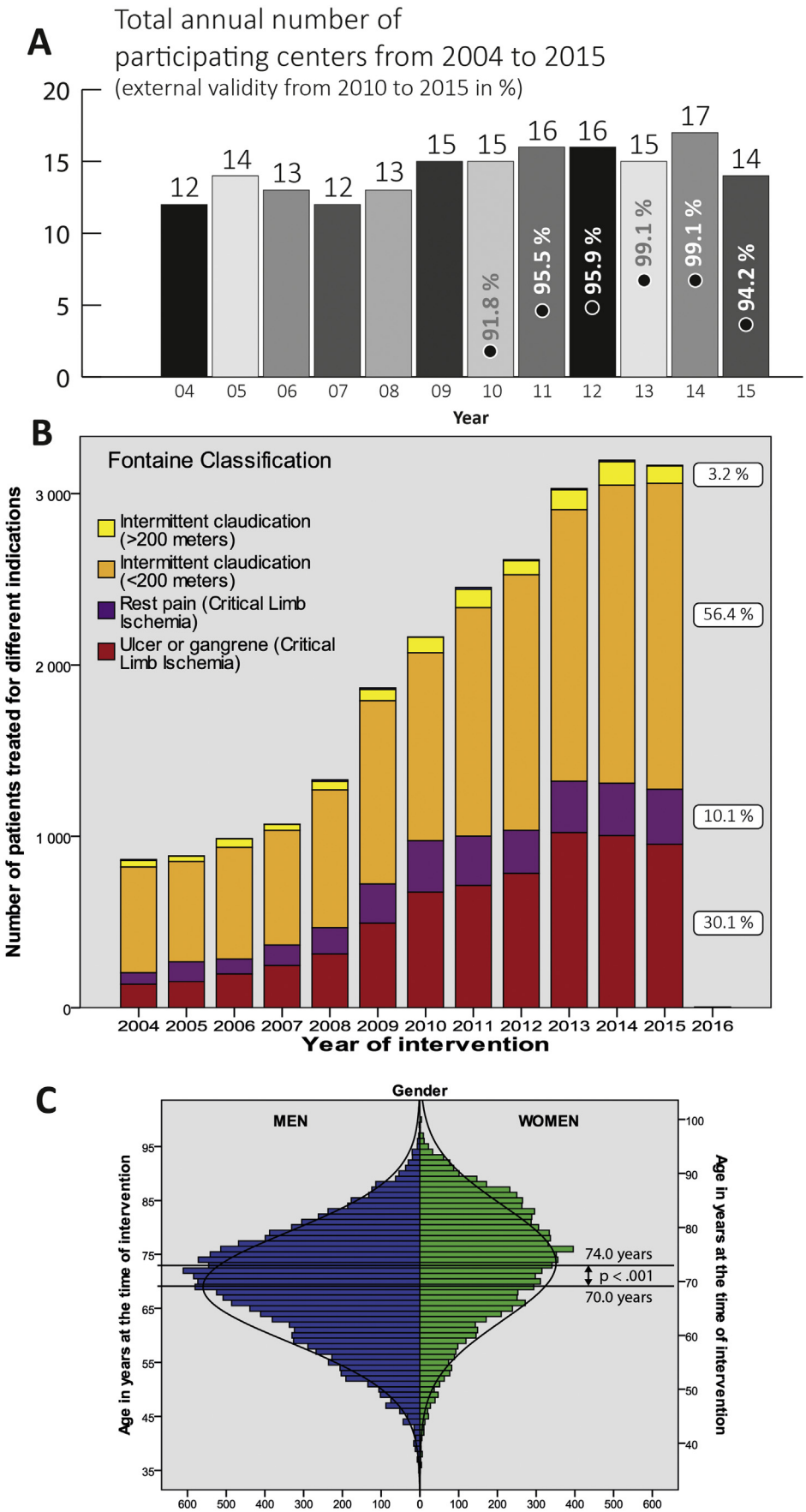

Figure 1. (A) Annual number of participating centres from 2004 to 2015. Upright in bars: Official annual documentation rate (external validity) for the years 2010—2015. (B) Increase of patients numbers with different Fontaine stages between 2004 and 2015. 60.6% were

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