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Safety and nano-toxicity in patients managed with plasmonic photothermal therapy: long-term clinical outcomes in NANOM-FIM trial

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Introduction: Our previous bench studies PLASMONICS and NANOM First-in-Man (FIM) trial documented total atheroma volume (TAV) reduction up to unprecedented 79.4 and 60.3 mm3 respectively. But the safety options in nanomedicine raise an issue of the optimal niche of these technologies at the real-world clinical practice.

Methods: This is a retrospective analysis of the 5-year long-term clinical outcomes at the intention-to-treat population (n=180) of NANOM-FIM trial (NCT01270139). The primary outcome was a composite of end-point of MACE-free survival, MACE, cardiac death, TLR (target lesion revascularization) and TVR (target vessel revascularization).

Results: Mortality (6 vs 9 vs 10 cases of cardiac death in groups respectively, $p<0.05$), MACE (14.3% of nano group vs 22.9% in stenting control, $p=0.04$), late thrombosis (2 vs 4 vs 6 cases in groups respectively, $p<0.05$) and TLR (3.8 vs 5.7% in nano and stent group respectively, $p=0.04$) were significantly higher in ferro group and stent control at 60-month follow-up, but the difference in the proportion of MACE-free survival and TVR incidence when compared between groups did not reach statistical significance ($p=0.33$). Diabetes ($p=0.03$), hypertension ($p=0.05$), previous or simultaneous PCI ($p=0.048$) and heart failure ($p=0.04$) were confirmed as strong independent predictors of cardiac death with high rate of mortality and late thrombosis in patients underwent stenting.

Conclusion: NANOM-FIM trial demonstrates high safety of the selected nano-technologies with better rate of mortality, MACE and TLR at the long-term follow-up when compared with conventional implantation of the second generation stent XIENCE V.

Biography

Alexander Kharlamov was born in Yekaterinburg, Russia, received his M.D. cum laude in 2005 from Ural State Medical Academy (Yekaterinburg, Russia). After finishing his internship in therapeutics and general cardiology in 2008 at the Department of Internal Medicine in Ural Institute of Cardiology (mentor - Prof. Jan Gabinsky, Yekaterinburg, Russia) he started as a physician and translational researcher at the Department of Interventional Cardiology, Acute Care Unit, and found a Department of Science in the Ural Institute of Cardiology working in the field of novel nanobiotechnologies in cardiology. The main research direction of the group now is a RTD of the new multifunctional nanoparticles for plasmonic photothermal therapy and imaging of coronary arteries. The Biotechnology Lab of the Institute is also involved in the growing of the bioengineered on-artery patch structures for the management of atherogenesis. Since 2007 he is working as a scientific assistant to C.E.O. Ural Institute of Cardiology and chief-cardiologist of the Ural Federal District (Russia) Prof. Jan Gabinsky in the field of international collaboration and innovative development of bio- and nanotechnologies. He has received his Ph.D. in Russia from Ural State Medical Academy in 2011. Since 2009 he has been working as a research fellow in some institutes in the Netherlands, including supervision of Prof. Patrick W. Serruys (Erasmus MC, Rotterdam, The Netherlands). He is an author of more than 55 articles and some grant proposals (NANOPLASTY, REVOLUTION, NIRVANA, REVERIE, DREAM projects) for the European Commission, European Research Council and FP7/CORDIS, and has received for his research work some national and international awards.

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A novel ultra-compact 2×2 optical switches with metallic mirror for nanophotonic optical interconnection

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Optical switch is a key component in integrated optics and the small footprint is critical for large scale integrated optics. In this paper, we present an ultra-compact 2×2 optical switch fully compatible with standard CMOS technologies. The switch structure was configured by half-rings with metallic mirrors side coupled to the cross-bus waveguide. Because a half-ring represented the whole ring of a microring-based switch, this configuration is half size of the normal switches without metallic mirrors. Transmission through such a switch structure implemented in a silicon on-insulator platform is investigated theoretically. The proposed switch can be connected together by two separated half-ring to reduce the overall size of photonic devices for nanophotonic optical interconnection.

Biography

Haili Hu has received his Bachelor degree from Harbin Institute of Technology (HIT), Harbin, China, in 2008. He is currently pursuing a Ph.D. degree in optical engineering in HIT. His current research interests include optical system design and fabrication, optical system simulation and optics precision measurement.

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