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Mein Zeichen: BB
25.07.2018

Project title:	Systematic process design for the fabrication of nanomodified fiber-based implants for use in ablation therapy (ProNano)
Partner:	Institute of Applied Medical Engineering, RWTH Aachen University
Duration:	1/2018 – 12/2019
Funding agency:	AiF/IGF

Mission Statement

Cancer is the second most frequent cause of death in Germany. The tumor mass often infiltrates or narrows vessels and hollow organs such as the windpipe, bile ducts, ureter and urethra. This can lead to a life-threatening situation. If possible, the tumor mass is removed surgically. The re-closure rate of these vessels by local recurrences is up to 40%. Currently, conventional metal stents or plastic tubes are used to keep the affected hollow organs open. These have the decisive disadvantage that they cannot keep the tubular structures to be treated open in the long term. Through local hyperthermia, mediated by inductively heatable nanoferrite fibers, the tumor can be locally destroyed several times if necessary, thus opening the tubular structure in the sense of "self-cleaning".

Approach

In the context of this application, a systematic process design for the production of nanomodified fiber-based implants for use in ablation thermia and permanent retention in the body will be developed.
An inductively heatable textile stent is required to implement this form of therapy. In course of this, a braided structure is used as a textile stent. This braided structure consists of polymer fibers which contain incorporated nanoferrites. The nanoferrites to be used are synthesized and compounded together with the polymer on a twin screw extruder to form a spinnable masterbatch. This masterbatch is then spun into inductively heatable fibers using the melt spinning process. The stent is advanced via a catheter system to the corresponding point in the body and then expanded by means of balloon dilatation. Balloon catheter insertion is already used for commercially available polymeric stent systems. After the stent has been positioned

in situ, the incorporated nanoferrites and the application of an inductive field heat up the braid. The nanoferrites release the absorbed inductive energy as heat via the polymer fibers to the tumor tissue and act as an intrinsic thermostat. In this process, the tumor tissue is obliterated by local temperature increases.

Acknowledgements

This IGF project was funded by the AiF within the framework of the program for the promotion of joint industrial research and development (IGF) of the Federal Ministry of Economics and Energy on the basis of a decision of the German Bundestag. We are grateful for this support. We are also grateful for the support of the FKT.

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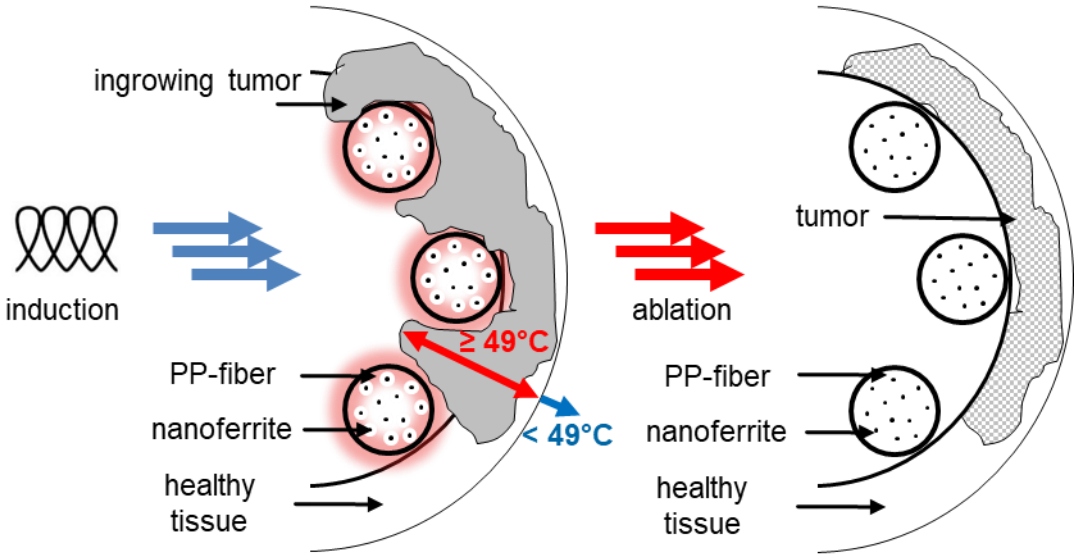

Figure 1 Nanoferrite-laden polymer fibers are inductively heated to locally destroy tumor tissue infiltrating a hollow organ through local hyperthermia.