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Experimental Study on Capturing of Magnetic Nanoparticles Transported in an Implant Assisted Cylindrical Tube under Magnetic Field

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Abstract : Targeted drug delivery is a method of delivering medication to a patient in a manner that increases the concentration of the medication in some parts of the body relative to others. Targeted drug delivery seeks to concentrate the medication in the tissues of interest while reducing the relative concentration of the medication in the remaining tissues. This improves efficacy of the while reducing side effects. In the present work, we investigate the effect of magnetic field, flow rate and particle concentration on the capturing of magnetic particles transported in a stent implanted fluidic channel. Iron oxide magnetic nanoparticles (Fe3O4) nanoparticles were synthesized via co-precipitation method. The synthesized Fe3O4 nanoparticles were added in the de-ionized (DI) water to prepare the Fe3O4 magnetic particle suspended fluid. This fluid is transported in a cylindrical tube of diameter 8 mm with help of a peristaltic pump at different flow rate (25-40 ml/min). A ferromagnetic coil of SS 430 has been implanted inside the cylindrical tube to enhance the capturing of magnetic nanoparticles under magnetic field. The capturing of magnetic nanoparticles was observed at different magnetic magnetic field, flow rate and particle concentration. It is observed that capture efficiency increases from 47-67 % at magnetic field 2-5kG, respectively at particle concentration 0.6 mg/ml and at flow rate 30 ml/min. However, the capture efficiency decreases from 65 to 44 % by increasing the flow rate from 25 to 40 ml/min, respectively. Furthermore, it is observed that capture efficiency increases from 51 to 67 % by increasing the particle concentration from 0.3 to 0.6 mg/ml, respectively.

Keywords : capture efficiency, implant assisted-Magnetic drug targeting (IA-MDT), magnetic nanoparticles, In-vitro study
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