

Surface modification of silicone catheter using two-step LF-plasma treatment technology to prevent bacterial adhesion

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Alireza Khoshnevisan,¹ Roya Mashayekhi,²
Fatemeh Riyahi Zaniyani³¹Department of Neurosurgery, Tehran University of Medical Sciences, Iran²Technical Supervisor, Polymer incubator, Polymer and Petrochemical Institute, Iran³Department of Neurosurgery, Tehran University of Medical Sciences, Iran**Correspondence:** Alireza Khoshnevisan, Department of Neurosurgery, Tehran University of medical sciences, Iran, Tel +98 21 8889 6696**Received:** June 25, 2025 | **Published:** June 26, 2025

Editorial

Ventriculoperitoneal shunts (brain shunts) are used to treat hydrocephaly. Shunt infection is a very difficult to treat and devastating complication that should be prevented in patients. Different prevention protocols have been suggested.¹ It is hypothesized that reduction of bacterial adhesion on to surfaces of shunt tube could be efficacious in preventing shunt infection. We have conducted an experimental study to evaluate bacterial adhesion to the surface of silicone tubes of the shunt in order to find a solution to reduce adhesion of specific bacteria to the tube outer surface.²

Bacterial adhesion on to surfaces of silicone shunts was evaluated after grafting of them due to 2-hydroxyethyl methacrylate (HEMA) as a hydrophilic monomer by two-step low frequency (LF) Ar/O₂ plasma irradiation. In first step, samples were irradiated by Ar/O₂ plasma to activate surfaces and then they were immersed into the HEMA solution. In second step, argon plasma copolymerization was performed on the surfaces of silicone shunts for tests in three groups 2, 3, and 4 for 5, 10, and 15 min, respectively.³

Evaluations for surface characteristics of these modified silicone shunts were made in terms of contact angle measurement, scanning electron microscopy, and atomic force microscopy (AFM). Group 2 showed the highest roughness and hydrophobicity. The results of AFM measurements of catheters in group 4 were close to those of the untreated group since degradation and re-etching of the HEMA-grafted surface was performed by irradiation for 15 min.^{4,5} Catheters in group 3 showed the highest level hydrophilicity and surface smoothness due optimum conditions of PHEMA-grafting. Morphological images and colony counts indicated that evaluations for size of colony and bacterial adhesion on to the surface were minimal in group 3. This research indicated that two-step LF-plasma irradiation served to decrease silicone shunt infection significantly.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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