Shima Tavakol

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Cellular and Molecular Research Center, Iran University of Medical Sciences, Tehran, Iran
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ACADEMIC BACKGROUND

Post-Doc of Medical Nanotechnology
Tehran University of Medical Sciences, School of Advanced Technologies in Medicine, Tehran, Iran (September 2014).
Project: 'Investigation the recovery effect of self-assembling nanofiber containing bone homing peptide and Long motif of Laminin on a spinal cord injury model in rat'.
Academic Supervisor: Prof. S. M. Rezayat

Ph.D of Medical Nanotechnology
Tehran University of Medical Sciences, School of Advanced Technologies in Medicine, Tehran, Iran (2014).
Thesis: 'Investigation on neural differentiation potential of puramatrix as a self- assembling peptide nanofiber along with laminin and bone marrowhoming peptide motifs on endometrial stem cells towards neuron'
Academic Supervisor: Prof. S. M. Rezayat and Prof. J. Ai

Master of Medical Nanotechnology
Tehran University of Medical Sciences, School of Advanced Technologies in Medicine, Tehran, Iran (Feb 2010).
Thesis: 'Comparative study of bone regeneration ability between demineralized bone matrix (DBM) over nano composite hydroxyapatite-gelatin scaffold with mesenchymal stem cell (MSC) in Rat'
Academic Supervisor: Prof. S. M. Rezayat

Bachelor of Medical Laboratory sciences
Isfahan University of Medical Sciences, Isfahan, Iran (Feb 2006)

Awards and Honors

- Recognized and encouraged as the **best** Ph.D graduate of Nanotechnology in **Iran** by Iranian Nanotechnology society.2014.
- Recognized and encouraged as the **best** Ph.D graduate of School of Advanced Technologies in Medicine by Tehran University of Medical Sciences. 2014.
- Winner of 3rd poster prize in the 9th CLINAM conference, 2016, Basel, Switzerland.
- Ranked **First**, among Ph.D students in the Board exam. 2012
- Ranked **3rd**, in the Ph.D Entrance Examination held by Ministry of Health and Medical Education. 2010
- Winner of the oral presentation prize in the 4th nanotechnology student's conference; Tehran. 2008
- Ranked **2nd**, in the M.Sc Entrance Examination held by Ministry of Health and Medical Education. 2007
- Ranked **3rd**, among Technician degree Graduate. 2003

Industrial Projects

- Study of active international, national organizations and countries in the field of Nano environment, supervisor: **Shima Tavakol**, 2007, Iran department of Environment, ITAN Institute (Finished).
- Study of active companies in the field of Nano environment and their products, supervisor: **Shima Tavakol**, 2007, Iran department of Environment, ITAN Institute (Finished).

Academical projects

- Formulation of oligopeptide and drug to induce angiogenesis and inhibit 5-α reductase in hair follicle via nanoemulsion method, Supervisor: **Shima Tavakol** 2015, Drug Nanocarriers Research Core, Razi Drug Research Center, Iran University of Medical Sciences, Tehran, Iran (Finished).
- Synthesis and characterization of microsphere containing of osteogenic small molecule encapsulated into self-assembling peptide nanofiber containing angiogenic peptide as an osteoconductive biomaterial. Supervisor: **Shima Tavakol,** 2015, Drug Nanocarriers Research Core, Razi Drug Research Center, Iran University of Medical Sciences, Tehran, Iran (Finished).
- Investigation on repair of spinal cord injury in rat using self-assembling nanofiber of Puramatrix and Matrigel. Supervisor: **Shima Tavakol**, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- Synthesis of gelatin nanofibers and its investigation as cell scaffold. Supervisor: Mahdi Adabi, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- Investigation on polymerization of tubulin derived from brain of sheep using self-assembling peptide nanofiber. Supervisor: **Shima Tavakol**, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (In progress).
- Investigation the recovery effect of self-assembling nanofiber containing bone homing peptide and Long motif of Laminin on a spinal cord injury model in rat. Supervisor: **Seyed Mahdi Rezayat**, 2014, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- Investigation on neural differentiation potential of PC12 cells on electrospun nanofibrous PLA/chitosan scaffold. Supervisor: **Shima Tavakol**, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- Study of antimicrobial and cytotoxicity effect of silver nano particle and silver nano particle citrate coated on protein structure, an in vitro study. Supervisor: **Shima Tavakol**, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- Chemical Synthesis, characterization and antimicrobial activity of Hydroxyapatite/Chitosan and Chitosan/nano-hydroxyapatite/nano-Silicon composite. Supervisor: **Shima Tavakol**, 2013, Student's Scientific Research Center, Tehran University of Medical Sciences (Finished).
- *In vitro* and *In vivo* study of bone regeneration of nanohydroxyapatite- chitosan composite powder. Supervisor: **Shima Tavakol**, 2011, Tehran University of Medical Sciences (Finished).
- Investigation on neural differentiation effect of puramatrix along with laminin and bone marrow homing peptide motifs on endometrial stem cells towards neuron. Supervisor: Prof. S. M. Rezayat and Prof. J. Ai, 2009, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences (Finished).

- Osteogenesis study of peptides derived milk in rat, supervisor: Prof.S.M.Rezayat, 2011, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences (Finished).
- Synthesis of biodegradable & biocompatible nano hydroxyapatie-PLGA T- plate by casting method, supervisor: Prof. J. Ai, 2009, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences (Finished).
- Comparative study for bone regeneration ability between demineralized bone matrix (DBM) over nano composite hydroxyapatite-gelatin with mesenchymal stem cell (MSC) in Rat, supervisor: Prof.S.M.Rezayat, 2007, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences (Finished).

Research experience

- Nanoemuslion and nanosphere preparation
- Synthesis of some nanoparticles
- Electrospining
- Cell culture
- Bone defect model in Rat
- Spinal cord injury model in Rat
- Endometrial stem cell isolation
- Tubulin extraction from brain
- Medical diagnosis laboratory techniques: Bacteriology (culture & identification), Hematology & immunology tests, Parasitology, Blood banking.
- Real-time PCR
- Immunocytochemistry
- Histomorphometry

PUBLICATIONS AND PRESENTATIONS

Articles published to refereed journals:

- Noggin along with a self-assembling peptide nanofiber containing long motif of laminin induces tyrosine hydroxylase gene expression. **Shima Tavakol**, Sayed Mostafa Modarres Mousavi, Behnaz Tavakol, Elham Hoveizi, Jafar Ai, Seyed Mahdi Rezayat. Molecular Neurobiology (2016) DOI: 10.1007/s12035-016-0006-0.
- Mechano-transduction signals derived from self-assembling peptide nanofibers containing long motif of laminin influences neurogenesis in in-vitro and in-vivo. **Shima Tavakol***, Sayed Mostafa Modarres Mousavi, Behnaz Tavakol, Elham Hoveizi, Jafar Ai, Seyed Mahdi Rezayat. Molecular Neurobiology (2016) DOI 10.1007/s12035-016-9836-z.
- In Vitro Differentiation of Human iPS Cells into Neural like Cells on a Biomimetic Polyurea. E Hoveizi, S Ebrahimi-barough, **Shima Tavakol**, K Sanamiri. Molecular neurobiology (2016) 10.1007/s12035-015-9663-7.
- Organelles and chromatin fragmentation of human umbilical vein endothelial cell influence by the effects of Zeta potential and size of silver nanoparticles in different manners. **Shima Tavakol***, Elham Hoveizi, Roya KARIMI, Seyed Mahdi Rezayat. Artificial Cells, Nanomedicine, and Biotechnology. 2016. Doi 10.1080/21691401.2016.1178132.
- Healing potential of fibroblast cells cultured on a PLA/CS nanofibrous scaffold in skin regeneration in Wistar rat. E Hoveizi, T Mohammadi, S Ebrahimi-Barough, Shima Tavakol. Koomesh 17 (3), 677-685, En77.
- Self-assembling peptide nanofiber containing long motif of laminin induces neural differentiation, tubulin polymerization and neurogenesis; in-vitro, ex-vivo and in-vivo

studies. **Shima Tavakol**, Reza Saber, Elham Hoveizi, Hadi Aligholi, Jafar Ai, Seyed Mahdi Rezayat. Molecular Neurobiology. (2015) doi: 10.1007/s12035-015-9448-z

- Chimeric self-assembling nanofiber containing bone marrow homing peptide's motif induces motor neuron recovery in animal model of chronic spinal cord injury; an in-vitro and in-vivo investigations. **Shima Tavakol**, Reza Saber, Elham Hoveizi, Hadi Aligholi, Jafar Ai, Seyed Mahdi Rezayat. Molecular Neurobiology. (2015) doi:10.1007/s12035-015-9266-3.
- Acidic pH derived from cancer cells may induce failed reprogramming of normal differentiated cells adjacent tumor cells and turn them into cancer cells. **Shima Tavakol*.** Medical Hypothesis (2014) 13;83(6):668-672.
- In vitro comparative survey of cell adhesion and proliferation of human induced pluripotent stem cells on surfaces of polymeric electrospun nanofibrous and solution-cast film scaffolds. S Ebrahimi-barough, **Shima Tavakol**, M Nabiuni. Journal of Biomedical Materials Research Part A. (2015) DOI: 10.1002/jbm.a.35420.
- Self-Assembling Peptide Nanofiber Containing Biologic Motif Induces Neural Differentiation, Tubulin Polymerization and Neurogenesis; In-Vitro, Ex-Vivo and In-Vivo Studies. **Shima Tavakol**, Reza Saber, Elham Hoveizi, Hadi Aligholi, Jafar Ai, Seyed Mahdi Rezayat. The Neuroscience Journal of Shefaye Khatam (2014) 2 (4), 49-49.
- Preparation of Pure PLLA, Pure Chitosan and PLLA/Chitosan Blend Porous Tissue Engineering Scaffolds by Thermally Induced Phase Separation Method and Evolution of the Corresponding Mechanical and Biological Properties. M ajid Salehi; Naseri Nosar; Amir Amani; Mahmood Azami; **shima Tavakol**; Hossein Ghanbari. International Journal of Polymeric Materials and Polymeric Biomaterials. (2015) 64 (13): 675-682.
- Differential effect of Activin A and WNT3a on definitive endoderm differentiation onelectrospunnanofibrous PCL scaffold. Elham hoveizi1, Jafar Ai, Somayeh Ebrahimi-barough and **Shima Tavakol**. Cell Biology International. (2015) 39 (5), 591-599. DOI: 10.1002/cbin.10430.
- Neuroprotective effect of transplanted neural precursors embedded on PLA/CS scaffold in an animal model of multiple sclerosis. Elham hoveizi, **Shima Tavakol,** Somayeh Ebrahimi-barough, Molecular Neurobiology. (2014) 51 (3), 1334-1342. DOI: 10.1007/s12035-014-8812-8.
- Investigating the effects of particle size and chemical structure on cytotoxicity and bacteriostatic potential of nano hydroxyapatite/chitosan/silica and nano hydroxyapatite/chitosan/silver; as antibacterial bone substitutes. **Shima Tavakol***, Mohammad Reza Nikpour, Elham Hoveizi, Behnaz Tavakol, Seyed Mahdi Rezayat, Mahdi Adabi, Sahebeh Shajari Abokheili, Mohsen Jahanshahi. Journal of Nanoparticle Research (2014) 16:2622.
- Investigation on the motor recovery effect of a self-assembling nanofiber in the spinal cord injury model in rat. **Shima Tavakol**, Hadi Aligholi, Arezou Eshaghabadi, Sayed Mostafa Modarres Mousavi, Jafar Ai, Seyed Mehdi Rezayat. The neuroscience journal of shefaye khatam. (2014) 2(2): 43-49.
- Small molecules differentiate definitive endoderm from human induced pluripotent stem cells on PCL scaffold. Elham hoveizi, Siruse Khodadadi, **Shima Tavakol**, Oveise Karima, Mohaamad Ali Nasiri. Applied Biochemistry and Biotechnology. (2014) 173(7):1727-36.
- Thermogel nanofiber induces neural-like cells from human Endometrial-Derived Stromal Cells; an in-vitro and in-vivo study in Rat. **Shima Tavakol**, Hadi Aligholi, Ali Gorji, Aresou Eshagh Abadi, Elham Hoveizi, Behnaz Tavakol, Seyed Mahdi Rezayat, Jafar Ai. Journal of Biomedical Materials Research: Part A. (2014) 102(12):4590-7.
- The effect of Noggin supplementation in Matrigel nanofiber-based cell culture system for derivation of neural-like cells from human Endometrial-Derived Stromal Cells. **Shima**

Tavakol, Mohammad Masummi, Seyed Mostafa Modarres Mousavi, Amir Amani, Seyed Mahdi Rezayat, Jafar Ai. Journal of Biomedical Materials Research: Part A. (2015) 27;103(1):1-7.

- Functionalisation and surface modification of electrospun polylactic acid scaffold for tissue engineering. Elham hoveizi, Mohammad Nabiuni, Kazem Parivar, Sareh rajabizelati, **Shima Tavakol**. Cell Biology International. (2014) 38(1):41-9.
- The Effect of Laminated Hydroxyapatite/Gelatin Nanocomposite Scaffold Structure on Osteogenesis using Unrestricted Somatic Stem Cells and in Rat. **Shima Tavakol,** Mahmoud Azami, Ahad Khoshzaban, Iraj Ragerdi Kashani, Behnaz Tavakol, Elham Hoveizi, Seyed Mahdi Rezayat Sorkhabadi. Cell Biology International. (2013) 37: 1181.
- The Effect of Carrier Type on Bone Regeneration of Demineralized Bone Matrix in Rat. **Shima Tavakol**, Ahad Khoshzaban, Mahmoud Azami, Iraj Ragerdi Kashani, Hani Tavakol, Seyed Mahdi Rezayat. Craniofacial Surgery. (2013) 24(6):2135-40.
- Programming of human endometrial-derived stromal cells (EnSCs) into preoligodendrocyte cells by overexpression of miR-219. Somaye Ebrahimibarough, Hamid Reza Kouchesfehani, Jafar Ai, Mahmoodinia M, **Shima Tavakol**, mohammad Massumi. Neuroscience Letters. (2013) 537: 65.
- Bone regeneration based on nano-hydroxyapatite and hydroxyapatite/chitosan nanocomposites: an in vitro and in vivo comparative study. **Shima Tavakol**, M.R Nikpour, A.Amani, M. Soltani, S. M. Rabiee, S. M. Rezayat, P. Chen, M. Jahanshahi. Journal of Nanoparticle Research (2013) 15:1373
- In vitro and In vivo Investigations on Bone Regeneration Potential of Laminated Hydroxyapatite/Gelatin Nanocomposite Scaffold along with DBM. **Shima Tavakol** , Iraj Ragerdi Kashani , Mahmoud Aazami , Ahad Khoshzaban , Behnaz Tavakol , Sharmin Kharazi, Seyed Mahdi Rezayat Sorkhabadi. Journal of Nanoparticle Research. (2012) 14:1265.
- A Porous Hydroxyapatite/Gelatin Nanocomposite Scaffold for Bone Tissue Repair: In Vitro and In Vivo Evaluation. Mahmoud Azami, **Shima Tavakol**, Ali Samadikuchaksaraei, Mehran Solati Hashjin, Nafiseh Baheiraei, Mehdi Kamali, Mohammad Reza Nourani. Journal of Biomaterial Science Polymer Edition. (2012) 23: 2353.

Proceeding papers

- Self-assembling Peptide Nanofiber Containing biologic motif Induces Neural Differentiation, Tubulin Polymerization and Neurogenesis; in-vitro, ex-vivo and in-vivo Studies. 2th International Neurotrauma Congress. February 19 (2015), Tehran, Iran.
- Termogel nanofiber induces Human Endometrial- Derived Stromal Cells to Neural Differentiation and Improves Motor Dysfunction Following Spinal Cord Injury. The Neuroscience Journal of Shefaye Khatam 2 (4), 101-101. 3rd International Road Safety Congress. February 18-19 (2014), Tehran, Iran.
- Investigations on the effect of particle size and surface charge on interaction of silver nanoparticles with cancerous and normal cells and biomolecules. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.
- Investigation on the Biocompatibility of Self-Assembling Peptide Nanofibers. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.
- Investigating the Effects of Particle Size and Chemical Structure on the Cytotoxicity and Bacteriostatic Potential of Nano Hydroxyapatite/Chitosan/Silica and Nano Hydroxyapatite/Chitosan/Silver; as a Substitute Bone Biomaterial. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.

- Investigation on neural differentiation potential of human Endometrial-Derived Stromal Cells via Matrigel nanofiber: in vitro and in vivo studies in rat. Basic and Clinical Neuroscience Congress, December 18-20 (2013), Tehran, Iran.
- Derivation of neural-like cells from human Endometrial-Derived Stromal Cells via Noggin supplementation in termogel nanofiber based cell culture system. Basic and Clinical Neuroscience Congress, December 18-20 (2013), Tehran, Iran.
- Bone regeneration Based on nano hydroxyapatite and Hydroxyapatite/Chitosan nanocomposite, International Congress on Nanoscience & Nanotechnology (ICNN2012) 8 - 10 September 2012, Kashan, I. R. Iran
- Biocompatibility Study of HA/Chitosan and HA/Chitosan/Si Nanocomposite using Endometrial Stem Cells, International Congress on Nanoscience & Nanotechnology (ICNN2012) 8 - 10 September 2012, Kashan, I. R. Iran.
- Application of nano in purification of sewage, abstract book of the 4th nanotechnology student's conference. 2007.
- Application of nano in control of air pollution, abstract book of the 4th nanotechnology student's conference. 2007.
- Application of nano in purification of industrial sewage, abstract book of the 4th nanotechnology student's conference. 2007.
- National & archives of IR Iran, Miracle of ants. No: 84720. 2006.

Patent

- An osteogenic and angiogenic cocktail. Shima Tavakol, Amin Almasi, Seyed Mahdi Rezayat. Under filling of United States Patent, US 62/347, 928.
- Hydrogel based peptide nanofiber containing long motif of laminin for application in medical studies; International category A61, Patent no 82433.
- Biodegradable and biocompatible nano composite t-plate implant and a method of synthesizing the same. Jafar Ai, Mahmood Azami, N Bahrami, Shima Tavakol. United States Patent Application 14/301,306:20140356410.

Book (Compilation)

- Nanoscience in Dermatology; Bioinspired nano-substrates for skin regeneration, 1 chapter, Elsevier (English) DOI: 10.1016/B978-0-12-802926-8.00026-4.
- New Developments in Gold Nanoparticles and Nanoshells Research, 1 chapter, Nova publication (English) in-print
- Nanomedicine. 2 chapters, Jahad Daneshgahi, Tehran, Iran. *Book Prize*.
- Introduction of Physiology (Persian) Publisher; Taaliye Andishe, Tehran, Iran.

Workshop presentations

- Nanoemulsion preparation, DNC, Razi Drug Research Center, Iran University of Medical Sciences, Tehran, Iran 2016.
- Nanotechnology in Drug Delivery, Iranian Society of Nanomedicine, Tehran, Iran., 2016.
- Synthesis of nanoparticles and their characterization, AMST association, Tehran University of Medical Sciences, 2014.
- Nanotechnology for neurodegenerative disorders, AMST association, School of Advanced Medical Technologies, Tehran University of Medical Sciences, 2012.
- Second Bone implant workshop, AMST association, Department of medicine number 6, Tehran University of Medical Sciences. 2011.
- The first Bone implant workshop, AMST association, School of advanced medical Technologies, Tehran University of Medical Sciences. 2011.

Oral presentations

- Self-assembling peptide nanofiber in tissue engineering. Stem cell and Nano-tissue engineering Seminar, 2016, Tehran, Iran.
- An investigation on the spinal cord recovery potential of self-assembling peptide nanofiber, An in-vitro and in-vivo study. 9th CLINAM Conference, (June 2016) Basel, Switzerland (small speech).
- Self-assembling Peptide Nanofiber Containing biologic motif Induces Neural Differentiation, Tubulin Polymerization and Neurogenesis; in-vitro, ex-vivo and in-vivo Studies. 2th International Neurotrauma Congress. February 19 (2015), Tehran, Iran.
- Investigations on the effect of particle size and surface charge on interaction of silver nanoparticles with cancerous and normal cells and biomolecules. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.
- Investigation on neural differentiation potential of human Endometrial-Derived Stromal Cells via Matrigel nanofiber: in vitro and in vivo studies in rat. Basic and Clinical Neuroscience Congress, December 18-20 (2013), Tehran, Iran.
- Bone regeneration based on nano hydroxyapatite and Hydroxyapatite/Chitosan nanocomposite, International Congress on Nanoscience & Nanotechnology (ICNN2012) September 8 - 10 (2012), Kashan, I. R. Iran
- Comparative study of bone regeneration potential between nano hydroxyl apatite- gelatin scaffold and demineralized bone matrix (DBM) in Rat. Nanotechnology students' conference, Gilan, 2011.
- Introduction of nanotechnology, the first seminar on nanotechnology and its medical application by AMST, AMST association, Tehran University of Medical Sciences. 2010.
- Application of nano in control of air pollution, the 4th nanotechnology students' conference, Tehran. 2007.

Poster Presentations

- Termogel nanofiber induces Human Endometrial- Derived Stromal Cells to Neural Differentiation and Improves Motor Dysfunction Following Spinal Cord Injury. 3rd International Road Safety Congress. February 18-19 (2014), Tehran, Iran.
- Investigation on the Biocompatibility of Self-Assembling Peptide Nanofibers. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.
- Investigating the Effects of Particle Size and Chemical Structure on the Cytotoxicity and Bacteriostatic Potential of Nano Hydroxyapatite/Chitosan/Silica and Nano Hydroxyapatite/Chitosan/Silver; as a Substitute Bone Biomaterial. International NanoSafety Congress, February 19-20 (2014), Tehran, Iran.
- Derivation of neural-like cells from human Endometrial-Derived Stromal Cells via Noggin supplementation in termogel nanofiber based cell culture system. Basic and Clinical Neuroscience Congress, December 18-20 (2013), Tehran, Iran.
- Biocompatibility study of HA/Chitosan and HA/ Chitosan/ Si Nanocomposite Using Endometrial Stem Cells, International Congress on Nanoscience & Nanotechnology (ICNN2012) September 8 - 10 (2012), Kashan, I. R. Iran.
- Application of nano in purification of industrial sewage, the 4th nanotechnology students' conference, Tehran, Iran. 2007.
- Application of nano in purification of sewage, the 4th nanotechnology students' conference, Tehran, Iran. 2007.

Professional Membership

- Head of Drug Nanocarriers Research Core at Razi Drug Research Center, Iran University of Medical Sciences, Tehran, Iran. 2015- 2016.
- Secretary of Education and Research Committee at Iranian Society of Nanomedicine, http://isnm.ir/Nano-News/84-%D9%8Fsecomisnm.html. 2014-present.
- Member of Nano-Tissue Engineering Committee, Presidency of the Islamic Republic of Iran, Vice Presidency for science and Technology. 2015-present.
- Head of advanced Medical Sciences and Technologies association (AMST), Tehran University of Medical Sciences. Tehran. 2010- Present.
- Member of Executive association of Interdisciplinary medicine (IDM), Tehran University of Medical Sciences. Tehran. 2009.

References

- Prof. S. Mahdi Rezayat, Head department of Medical Nanotechnology, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, rezayat@sina.tums.ac.ir.
- Prof. Mohammad Taghi Joghataei, Head of Cellular and Molecular Research Center, Iran University of Medical Sciences, mt.joghataei@yahoo.com.
- Prof. Jafar Ai, Head department of Tissue Engineering, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, jafar_ai@tums.ac.ir.