Development of a novel nucleic acid transfection system based on renal press-poration method

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In vivo transfection of gene and oligonucleotides is one of the consequence technologies for biomedical research and development of gene therapy and nucleic acid drug and, therefore, the delivery system to various organs is needed. The kidney is one of the most important organs in biomedical research and treatment, since there are many genetic and acquired renal diseases for which there are no effective treatment protocols, i.e., Alport's syndrome, Fabry's disease, diabetic nephropathy, kidney cancer, acute and chronic renal failure. However, many conventional virus and non-virus mediated transfection systems are inefficient, because basement membrane of renal capillary vessel makes macromolecules low permeable.

We have developed a novel renal transfection method, i.e., the renal press-poration method. siRNA as well as plasmid DNA were efficiently transfected to the kidney by lightly pressing the kidney after an intravenous injection of siRNA or plasmid DNA. This method is naked siRNA or plasmid DNA transfection that has the advantage of lack of toxicity associated with the immune response and, therefore, was not caused renal dysfunction. In addition, siRNA and plasmid DNA could be transfected to the whole kidney by this method, although transfection of nucleic acids was restricted to the inject site in the case of direct injection. In conclusion, renal press-poration method that is convenient, efficient and safe is versatile method of gene and siRNA transfection to the kidney for drug development research and clinical treatment.