A hand-held multi-degree of freedom (DOF) robotic forceps was developed to aid the performance of difficult tasks. The diameter of the developed robotic forceps is 3.5 mm, and its tip has three DOFs, namely, bending, rotation, and grip. Experimental results showed that the robotic forceps had an average needle insertion force of 1.7 N. Therefore, an increase in the needle insertion force is necessary for practical application of the developed device [1)].

1)
Okubo T, Harada K, Fujii M, Tanaka S, Ishimaru T, Iwanaka T, Nakatomi H, Sora S, Morita A, Sugita N, Mitsuishi M. Hand-held multi-DOF robotic forceps for neurosurgery designed for dexterous manipulation in deep and narrow space. Conf Proc IEEE Eng Med Biol Soc. 2014 Aug;2014:6868-6871. PubMed PMID: 25571574.