Implant wireless communication has been so far attracting much attention as a promising technology in health care and medical applications. In this paper, for realizing reliable and high-speed implant communication, we pay attention to ultra wideband (UWB) transmission. This paper develops a transmit diversity antenna whose size can be acceptable to implantable medical devices and investigate the performances of the developed diversity antenna based on a finite difference time domain (FDTD) method. Furthermore, we propose an implant communication system with the developed diversity antenna and demonstrate that our proposed system can improve the reliability of the implant communication.