



**MANIPAL**  
ACADEMY of HIGHER EDUCATION  
(Institution of Eminence Deemed to be University)

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Vice Chancellor

### **Design and Development of an Indigenous Cochlear Implant System**

A cochlear implant is an expensive hearing device, costing around ₹10 lakh, and is therefore unaffordable for many hearing-impaired people in our society. It is also highly complex in design, and only about 5 countries worldwide manufacture this device. Even countries such as the UK, Germany, and Japan import it. India has more than two million people with sensorineural deafness—individuals who cannot hear and, therefore, cannot develop speech—and many of them require this costly implant. Every year, nearly 20,000 children are born deaf in India.

I have known Dr. V. Bhujanga Rao, a DRDO scientist, who has been involved in the design and development of the Indian cochlear implant from first principles since 2007, alongside his other important official responsibilities. As an ENT surgeon from the Army Medical Corps, I was nominated by the Armed Forces Medical Services (AFMS)/DGAFMS, Government of India, to review the progress of this project at regular intervals from 2007 onwards. I have reviewed this project from the concept stage—of which Dr. Bhujanga Rao is the Chief Designer—on multiple occasions and at various stages of its development. Later, I was involved in conducting cadaver trials at AFMC, Pune, to verify device compatibility, including the specialised surgical tools and the programming system developed for this implant. Research funding for the project was provided by the Society for Biomedical Technology, a not-for-profit agency under the Government of India.

Subsequently, I was nominated by the medical devices regulatory body as the Chief Clinical Coordinator to oversee human clinical trials in the country. The Drugs Controller General of India (DCGI), Ministry of Health, granted permission to undertake these trials. Prior to this, the implant underwent animal trials, environmental trials, EMI/EMC trials, biocompatibility testing, accelerated ageing, reliability testing, and software validation to meet the required medical standards. Regular reviews were conducted by experts in the field before clearance was granted for clinical trials. The design of such a device demands expertise in signal processing, material science, physics and the physiology of the human ear, microelectronics, micro-packaging, mechanical engineering, and product design.

To date, the “bionic ear” remains one of the rare examples of an electronic device that has successfully replaced a human sensory organ—the ear—for the profoundly deaf. It is a major boon to the hearing-impaired community. With sustained commitment and tenacious effort over nearly 18 years, and with profound multidisciplinary expertise extending well beyond the call of his official duties, Dr. Bhujanga Rao has enabled this ground-breaking biomedical development in the country. One implant recipient who was fitted with the first indigenous implant at Christian Medical College Hospital, Vellore, used it continuously for 4 years and 9 months, thereby supporting the design principle and proof of concept.

During the clinical trials, the implant was manufactured in limited series by Shree Pacetronix, Indore. Development of an upgraded version has since been transferred by DRDO to a commercial firm for further improvement and production.

I greatly appreciate the diligent and scholarly efforts of Dr. V. Bhujanga Rao, whose expertise across several disciplines guided this project from the concept stage through human clinical trials. This is India's first indigenous cochlear implant, and I am confident it will help thousands of children in the country in the years to come.

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