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CHALLENGE OF T.U.B.E.R.O. IN PRACTICAL BIOMEDICAL ENGINEERING RESEARCH. REVIEW

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A b s t r a c t

The following text is based on my presentation at the scientific symposium 1st Round Table Meeting Brno-TUBERO Biomedical Engineering (BME) Research held in Sept. 4th at the Masaryk University Faculty of Medicine in Brno. I explained the accomplished history and objectives to the establishment of TUBERO, established in July 2003 and funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan through its Special Coordination Funds for Promoting Science and Technology. More than four years have passed since the launch of this five-year project. I also explained up-to-date results of 21 projects and our future plans for promoting the scheme in BME education and research in our University.

K e y w o r d s

TUBERO, Tohoku University, Special coordination funds, Scientific project

Background of TUBERO Project and our main purposes in BME research

Biomedical engineering (BME), a field by merging new discoveries in life science and medicine and engineering and technology has advanced rapidly in the last quarter of the 20th century. In Japan, although the nation enjoyed the healthy advancement of life science and innovation in engineering and technology, these have not been utilized for biological research and development of analysis and treatment in medicine. The TUBERO Project is a five-year project with an annual budget of one billion yen, funded by a strategic research fund named Special Coordination Funds for Promoting Science and Technology, started in 2003 as the largest project of its kind funded by MEXT. Tohoku University is recognized as a leader both in advanced science and technology and in life science and medicine in Japan and also there have been numerous joint researches in BME, but unfortunately no system to nurture human resources and promote research in this multidisciplinary field. Reflecting on this, we sought permission in the TUBERO Project for closer

cooperation between the life sciences, medicine, and engineering and technology disciplines. As well as gaining research results, our other mission is to continue and develop the program even after the completion of the subsidized 5-year period, and to establish a Graduate School of Biomedical Engineering for developing capable human resources, and a Biomedical Engineering Research Center for the promotion of research in our University.

In this regard, TUBERO's basic concept was to make the end-point in clinical practice and the market available to the medical profession, to patients, and ultimately to the public. We named this area of BME as "practical BME", as shown in this picture. Therefore, we set a five-step ranking marking the level of progress to show how close the research was to actual clinical patients, while considering technical interests evaluated in terms of intellectual property. Level 5 is the stage where research has started at the clinical level; level 4 means that animal testing is finished and data is being prepared for application to the Ethics Committee; level 3 is the stage of animal testing; level 2 is the stage where the relevant examinations or medical equipment are under development; and lastly level 1 is the stage where the amount of support at the clinical level has been determined and ideas are being exchanged with clinical researchers regarding a prototype which uses the targeted technology. The stage of all tasks in April 1st, 2007, but we hope the research results of as many tasks as possible will reach level 5, in other words the clinical level, before the end of the TUBERO Project in March 2008.

Four major fields of practical BME in TUBERO Project

We selected and targeted to these four major fields as the main targets of the TUBERO.

They are biomaterial science, nanomedicine, biofunctional science and advanced information, and communications and research as exemplified in each box. Planning, organising and managing the 21 tasks which were determined within several months, before the second fiscal year (April. 2004). The name of each task executive, their positions inaugurated in TUBERO and their partners in the Medical Department which was selected for promoting our Mission explained in the first section are listed.

Institute for International Advanced Research and Education and the Graduate School of Biomedical Engineering

From the beginning, a common awareness within our University was built to pioneer new fields of study through a transdisciplinary approach. This fundamental philosophy has led to the realization of such projects as TUBERO. At present, Tohoku University is working to implement structural reforms through the "Creation of a System for Interdisciplinary Research and Education" and in April 2006, the University established the "Institute for International Advanced Research and Education". The Biomedical Engineering Research Center, which is planned as the post-TUBERO mission and the other projects of the 21st Century COE (Center of Excellence) project will be integrated into this organization.

On the other hand, Tohoku University has been planning to rearrange the present system and decided to create a new graduate, Graduate School in Biomedical Engineering, which contains 42 faculty members for educating researchers in this interdisciplinary field. After getting the permission of the MEXT, it will be opened officially in April, 2008. Those two systems will fully satisfy our original mission.

Translational Research Center

At present it has been determined to create a new space for Clinical Translational Research on the 13th floor of the new west ward. As the operation of the former west ward moved to a new building at the end of September 2006, it was reformed into a facility for translational researches, including those in the field of biomedical engineering.

The organization named Tohoku University Translational Research Center, or TRC, to conduct preclinical research on medicines, regenerative medicine and medical equipment, to obtain certification, and to launch them on the market without obstacle has been permitted and supported by the new cooperation fund by the MEXT in Sept. 2007 and officially launched. At TRC we will provide comprehensive guidance and support until the product reaches clinical level, offering systematic support for the research.

CONCLUSION

Tohoku University has commemorated its 100th anniversary in 2007. Its tradition since its foundation is based on the concepts of a "research-intensive university" and a "university open to the world and the community". I strongly hope the collaboration between Masaryk University and Tohoku University School of Medicine or Graduate School of Biomedical Engineering and all BME research people will be promoted and developed in this framework in future. Joint research between two countries will advance more rapidly and effectively in BME. I strongly believe that sincere effort of so much different two countries will have an impact on engineers, encouraging them to develop better equipment and more importantly better well-being of both people. This is what TUBERO intends to do.

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QUALITY OF LIFE IN PATIENTS AFTER ACUTE STROKE

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A b s t r a c t

The aim of this study was to evaluate the questionnaire quality of life (SF-36 short-form) in patients after acute stroke and to compare it with Functional Impairment Measure (FIM).

Methods: We examined 40 patients with acute stroke with the FIM questionnaire and Index of SF 36.

Results and conclusion: We have not found, after rehabilitation, any correlation between FIM and the index of quality of life in patients with acute stroke. Correlations between the physical component and mental component summary showed that in younger patients physical health correlates with mental state.

K e y w o r d s

Stroke, Quality of life, Rehabilitation, Functional impairment measurement

INTRODUCTION

Stroke is a leading cause of disability among elderly people. In addition to physical, emotional and social consequences, the economic impact of stroke is tremendous. The incidence of stroke increases markedly with age; ageing populations are exposed to an increasing risk of stroke in western countries (*13*).

Little is known about the effectiveness of long-term stroke physiotherapy. There are no generally accepted guidelines that determine the optimal timing, intensity or duration of rehabilitation. We have not found any data as to what kind of physiotherapy is the most beneficial and resource-efficient for patients with residual disabilities living in their homes. Several reports have addressed the need for psychological support and enhancing social activities in order to reach the ultimate goal in stroke rehabilitation. Many stroke patients fail to resume full lives, and a major negative impact of stroke on family functioning is not an infrequent phenomenon. Therefore, stroke rehabilitation requires a long-term perspective, extending to several years after the onset of stroke (*13*).

The role of rehabilitative efforts has been widely recognised as being essential in the acute stage of stroke. The beneficial effects of stroke unit rehabilitation have been