Letter To Editor

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Intra-Maxillary Macro-Molecular Releasing and Blood Monitoring in Therapeutic Development of Endocrinology

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Frequently invasive procedures including intravenous injections and blood monitoring are still highly limited currently due to the relative irritations and unbearable sufferings. Actually the above medical procedures only perform for the critical situations in hospital by central venous catheter, Swan-Ganz, artery line, and so on [1]. The above facts limit the therapeutic development and restrict current medication as a kind of passive treatment for those chronic and metabolic diseases without life-threatening properties.

On the other hand, these invasive procedures may provide powerful curative effects and significant experimental results due to directly contact to the inside blood without passing through the gastrointestinal (GI) tract, sublingual mucosal uptake and other pathways. However, skin and mucosal barriers seems inevitably destructed for the outside medical device to reach the cardiovascular (CV) system. Furthermore, once when the connection is established, bacterial accumulation may occur and the risks of infection may increase with time [2]. The above paradox seems insoluble. Fortunately, with technology improvement, dental implant has become a mature procedure since first announced by Dr Brånemark in the 1970's [3]. And such technique along with the artificial titanium fixture may provide the possibility to create a new therapeutic pathway. Traditionally the tooth pain pathways are mainly from its inside pulp structure and the outside periodontal ligament (PDL). However, both of them will be taken off while dental implant replacement, and such fact may allow us to create the pathway to reach the inside bone marrow and the surrounding blood pool [4-6].

The implant supported device is composed by the pure titanium implant fixture, and the above replaceable abutment with various medical purposes, including drug releasing and blood monitoring modules. Due to the anatomic differences, maxillary blood contact may be superior than that of the mandible with more benefits and less side effects including infection tendency. These kinds of intelligent modules inside the above abutment may be responsible for various biological functions with integrated circuit (IC) chip, power supply, and wireless elements inside for distant control. The above electronic elements neither contact the below bone marrow nor connect to the outside oral cavity environment to prevent from further contaminations. Traditionally the implant size is ranged from 4-6 mm in width to 8-15 mm in length according to the surrounding bony structures [7], and that may result in some restrictions in the inside drug loading dosage and its further medical applications. Generally the maximal loading volume is around 0.3-0.5 mL inside, and the releasing curve may be similar to slowly dissolving around the surrounded bone structures to avoid osseointegrative destructions and further peri-implantitis. That implies massive and rapid drug loading for emergency purpose is improper within such an intra-maxillary releasing pathway. Besides, both of the enzyme coating and power supply is sufficient to last for around 1 month by continuous blood sugar monitoring per 5 min with current technology. Therefore monthly dental clinic appointment may be recommended for both infection control and module replacement.

With the above characteristics, the implant supported modules may achieve macro-molecular drug releasing and blood monitoring for long-term, relative painless and continuous properties. Therefore it may apply in some invasive medical routines to reduce the suffering, such as multiple dosage insulin injection (MDII) in diabetes mellitus [8], and functional peptide delivery in Alzheimer's disease [9]. Furthermore, appropriate cooperation of the drug releasing and blood monitoring modules may lead to creative treatment thinking process toward endocrinology. That means with continuous blood monitoring every 5 min, we may achieve "detail balance" in the cardiovascular system, and control the electrolyte balance much better than ever. For example, detail control of the calcium level balancing may reduce the risk of demineralization in the bone structure and prevent from further osteoporosis, which may result in life-threatening fracture accidents in the elderly. Long-term and intensive specific molecular protein control in the circulatory system may also bring benefits in wrinkle formation, which is tough to realize within current medical procedures due to invasive properties.

Intra-maxillary drug releasing and blood monitoring may bring much more possibilities and improve current medical

procedures. However, relative therapeutic developments and the module improvement along with the safety evaluation are just at the beginning. It also presents highly interdisciplinary properties in wireless control, mechanical and electronic integrations to achieve the accuracy and safety purpose.

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