Bone regeneration strategy for mandibular osteomyelitis using periosteum-derived osteoblasts and oxygen-carrier microparticles ; in vitro and in vivo study

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The pathogenesis of jaw osteomyelitis is associated with various dental problems and facial trauma. Although the introduction of antibiotics and the improvement of dental care have contributed to reduce the incidence of chronic jaw osteomyelitis, it is still one of intractable diseases in maxillofacial clinics. In addition, so far, there is yet no standardized and systematized therapy for chronic jaw osteomyelitis. Currently, chronic jaw osteomyelitis is approached by long-term (6 to 12 weeks) antibiotics treatments together with surgical procedures such as sequestrum excision, curettage, or radical excision. And in many cases, bone graft is further required for the recovery of outward jaw appearance and mastication function. Considering that this-type bone grafting needs more than one time when dealing with chronic jaw osteomyelitis, the utilizing tissue-engineered bone formation with stem cells from the patient may be very useful. However, when stem cells seeded in common tissue engineering scaffolds were introduced into bone tissue in vivo, most of them are known to be not survived due to insufficient or lack of oxygen supply from nearby vessels. In order to overcome this issue, we have developed oxygen carrier-loaded hollow micropaticles which release oxygen slowly into its surrounding environment. Here, we discuss a new approach to chronic osteomyelitis in which an oxygen slow-releasing material combined with periosteum-derived mesenchymal stem cells are utilized for bone regeneration.