

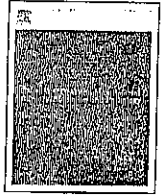


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Comparison study between plasma rich in growth factors and platelet-rich plasma for osteoconduction in rat calvaria



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ABSTRACT

Objective: Plasma rich in growth factors (PRGF) and platelet-rich plasma (PRP) can be rapidly obtained from patient blood. They are a new and potentially useful adjunct in oral and maxillofacial bone repair or regenerative surgery. The aim of this study was to compare the possibility of new bone formation using PRGF and PRP.

Methods: The osteogenic potential with transplantation of PRGF or PRP onto rat calvaria was evaluated by histologic examination and microCT. PRGF or PRP was prepared by centrifugation of rat whole blood (WB). First, the cells in the blood product were counted; there were no leukocytes in PRGF, and PRP included leukocytes. PRGF contained higher levels of TGF- β 1 and PDGF-BB than PRP. Furthermore, PRGF or PRP was transplanted onto calvarial bone of rats.

Results: MicroCT showed that PRGF promoted an increase in bone volume when compared to PRP. Histological observation demonstrated that the PRGF group showed newly formed bone in a wide range. In addition, the PRP group showed numerous inflammatory cells compared to the PRGF group in HE-stained specimens. This suggests that PRP might delay bone regeneration due to the inflammatory response.

Conclusions: PRGF has more availability for bone regeneration than PRP, and PRGF may be useful in bone regeneration treatment.

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1. Introduction

Platelet concentration products, which are autologous constituents of inductive factors obtained from blood, have high concentrations of platelets containing various growth factors [1]. The concentration of autologous platelets in plasma [platelet-rich plasma (PRP)] and the growth factors contained within platelets have been studied since 1998 [2]. The previous study reported that the combined use of autogenous bone with PRP increased radiographic and histomorphometric bone densities [2]. In addition, PRP has been used in bone augmentation for dental implants or fracture healing of jaw bone [2–5]. However, it has been shown that PRP formulations have different biological activities, depending on their preparation and administration [6–8].

The preparation of plasma rich in growth factors (PRGF) is one way to concentrate platelets [9,10], and in 1999, it was shown

to have several advantages, including the enhancement of bone regeneration and rapid soft tissue healing [11]. This system is advantageous as it requires only one step of centrifugation and is leukocyte-free, thus avoiding higher levels of pro-inflammatory cytokines [3]. In addition, PRGF contains high levels of growth factors such as transforming growth factor (TGF)- β and platelet-derived growth factor (PDGF), which are associated with bone regeneration [12]. However, there has been little basic research into the efficacy of PRGF in bone regeneration [9].

The aim of this study was to compare between PRGF and PRP to the availability of bone formation in transplantation of using histologic findings and microCT analysis.

2. Materials and methods

2.1. Preparations of PRGF and PRP

A total of 27 Sprague-Dawley male rats (age: 15 weeks) weighing 405–415 g were purchased from Japan SLC (Shizuoka, Japan). Rat whole blood (5 ml) was collected from the external jugular vein by syringe aspiration via direct venipuncture with a 21-gauge needle. Blood was immediately placed into 5-ml sterile extraction

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