Clinical Usage Experience and Evaluation of Application of Platelet Rich Plasma Gel in Impacted Tooth Extraction: A Preliminary Study

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SYNOPSIS
The aim of this study was to investigate the safety of use of platelet rich plasma gel (PRPG) during the healing process of extracted sockets of impacted mandibular third molar in humans.

Ten patients were included in the present study. Impacted third molars were surgically extracted in the same session. The prepared PRPG was placed into the extracted sockets. We evaluated the wound after 7 days for postoperative redness, swelling, pus discharge, pain and the panoramic radiograph for changes in bone at the surgical site. Healing was uneventful in all the cases treated with PRPG. Panoramic radiographic examination after around 6 months did not show abnormal bone formation at the surgical site.

The present study suggests that the usage of PRPG for impacted third molar extraction had no adverse effects and PRPG can be safely used in the healing process of extracted sockets.

Key words: Platelet rich plasma (PRP) Gel, extracted socket, Growth factor

INTRODUCTION
The early and late effects of Platelet Rich Plasma (PRP) alone on healing of extracted sockets have been previously evaluated in an experimental animal study. Srisurang et al. reported the efficacy of PRP used for epithelialization of palatal free graft in minipigs. Hatakeyama et al. stated the effects of PRP on healing of extracted sockets in dogs.

Recently, an easy technique to extract PRP gel (PRPG) was introduced. Shah et al. reported the efficacy of PRP gel in periodontal patients. However, very few studies have investigated the safety of PRP use during the healing process of sockets after extraction of impacted mandibular third molars in humans. In the present study, we evaluated the safety of PRPG in extracted sockets of impacted mandibular third molars.
MATERIALS AND METHOD

1. Patient Selection
From August 2012 to April 2014, patients who were referred to the Department of Oral surgery, Osaka Medical College, with pain or discomfort in the mandibular third molar region were subjected to radiographic and oral examinations. The main criterion for inclusion of patients in the study was the presence of bilateral or unilateral soft tissue impacted mandibular third molars. In accordance with the criteria, ten systemically healthy patients (2 males, 8 females, mean age 23.8 years) were included in the study with an indication for surgical extraction of the bilateral or unilateral mandibular third molars due to pericoronitis or prophylactic reasons under general anesthesia. An informed consent was obtained from all patients. This research was approved by ethic committee in Osaka medical college (No: 2012018).

2. Preparation of PRPG
Twenty minutes before starting the surgery, 20 mL of venous blood was collected in a sterilized dry, neutral glass tube without an anticoagulant. After immediate centrifugation (Centrifuge 416G MORITA, Japan) at 2750 rpm for 10 minutes with 1000G, the platelet-poor plasma, which accumulated at the top, was discarded. PRPG was dissected approximately 2 mm below its connection to the red corpuscle (Fig. 1A).

Table 1  Detail of patients treated with PRPG and Postoperative symptoms

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Gender</th>
<th>Surgical site in mandibular</th>
<th>Redness</th>
<th>Swelling</th>
<th>Pus discharge</th>
<th>VAS</th>
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<td>++</td>
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<tr>
<td>No.3</td>
<td>27</td>
<td>M</td>
<td>Bilateral third molar</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
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<td>22</td>
<td>F</td>
<td>Bilateral third molar</td>
<td>-</td>
<td>-</td>
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<td>4</td>
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<tr>
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<td>++</td>
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<td>+</td>
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<td>3</td>
</tr>
</tbody>
</table>

Abbreviations: F, female; M, male; PRPG, platelet-rich plasma gel; VAS, visual analog scale

Figure 1
(A) The tube after centrifugation for ten minutes (B) The PRPG ready to use (C) Application of PRPG into extracted socket (D) After application of the PRPG and primary wound closure.
Figure 2
(A) Panoramic radiograph of a patient with bilateral soft tissue impacted mandibular third molar before surgery (B) Radiograph taken 2 months after surgery (C) 4 months, and (D) 11 months.

Figure 3
(A) Panoramic radiograph of a patient with unilateral soft tissue impacted mandibular third molar before surgery (B) Radiograph taken 3 months after surgery (C) 7 months (D) Intraoral photograph after 2 months after surgery.
3. Surgical Procedure
To standardize the surgical procedure, after general anesthesia, impacted mandibular third molars of the same patient were extracted in the same session. An incision starting from the trigonum retromolare was continued along the buccal sulcus of the second molar. After elevation of the full-thickness envelope flap, crown portion of the third molar was sectioned when necessary, by means of a steel fissure bur, under constant water irrigation. The third molar was extracted and the soft tissue remnants were removed as required. After hemostasis was achieved, PRPG (Fig.1B) was immediately administered into the sockets and the wound was primarily closed with 3.0 silk sutures (Fig.1C,D).

All patients were prescribed 1 g Ceftriaxone Na twice a day for 3 days by intravenous drip, Cefcapene pivoxil hydrochloride hydrate 300 mg three times a day for 3 days by oral administration, Loxoprofen sodium hydrate 60 mg by oral administration on pain and 7% Povidone-iodine mouth rinse three times a day for 2 weeks. Nevertheless, the patients were instructed to begin mouth rinsing at least 24 hr after surgery to prevent mobilization of the clot within PRPG-treated extraction sockets. Sutures were removed 7 days after the surgical procedure.

We observed the wound 7 days after for postoperative redness, swelling, and pus discharge, and visual analog scale for pain and panoramic radiograph after around 6 months for postoperative bone changes.

RESULTS
In all cases, PRPG was harvested favorably. The PRPG-treated sockets showed no wound dehiscence. No significant postoperative swelling, redness or pain was noted in any of these cases. There was no postsurgical infection in any of the surgical sites.

Panoramic radiographic findings taken after two months revealed normal bone healing (Fig 2, Fig 3, Table 1).

DISCUSSION
Platelet-rich plasma (PRP) is a volume of autologous plasma that has a platelet concentration above baseline. Normal platelet counts in blood range between 150,000/μL and 350,000/μL and average about 200,000/μL. PRP with 1,000,000 platelets/μL has been shown to enhance bone and soft tissue healing; hence, this concentration of platelets in a 5-mL volume of plasma is considered as the working definition of PRP today. PRP is developed from autologous blood.

The increased number of platelets within PRP delivers an increased number of growth factors to the surgical area. The seven known growth factors in PRP are: platelet derived growth factors (PDGF α α, PDGF β β, PDGF α β); transforming growth factors beta-1 and 2, (TGF-β1, TGF-β2); vascular endothelial growth factors (VEGFs); and epithelial growth factors (EGFs).

PRP is widely used in the medical field. For example, Torrecillas J et al. reported the effect of PRP and Hyaluronic Acid for the treatment and care of pressure ulcers4. Jiritano et al. stated PRP application over the driveline of a left ventricular assist device to treat infection5. Marx et al. reported enhancement of bone graft healing in bone defects on PRP application6. Kim et al. also stated that PRP heals bone defect in rabbit-skull7. Shah et al. suggested periodontal treatment of an intrabony defect with platelet rich fibrin5. There are some reports that PRPG enhances bone and soft tissue healing. Therefore PRPG can be applied in case of tooth extraction. However, the fluid nature of PRP makes
it difficult to handle in extracted sockets. In the present study, we prepared PRP gel and applied it to extracted sockets and good results were obtained. We expected that growth factors can relieve postoperative symptom and PRP can assist bone healing. Tara et al. reported growth factors are a realistic way to improve and expedite both soft tissue and bony wound healing 6.

There are many indigenous bacteria in oral environment. Therefore, the application of some extraneous material has risk to wound for infection. However, in the present study, PRPG was made only from autologous blood. So, PRPG is low risk of infection and in actuality, none of the cases showed adverse events. So, it is suggested that PRPG can be safely used to heal bone and soft tissue. However, the number of cases in the present study was too small to confirm the effectiveness of PRPG. A larger sample is required to demonstrate its efficacy for application in oral and maxillofacial surgery.

CONCLUSION
In the present study, we reported the usage of PRPG for impacted tooth extraction. There was no postsurgical infection in any of the surgical sites. We had sufficient result in this study.

REFERENCES

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