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PR554

Biological evaluation of carbonated apatite granules for use as bone graft substitutes

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Background and Aim: Although the gold standard for bone reconstruction is autograft, it has serious limitations including the invasive surgery to healthy site and insufficient availability. Xenograft also has limitations including potential infection risks. To solve these problems, we focused on synthetic carbonated apatite granules (CO_3Ap), which is the inorganic component of bone. In this study, we aimed to evaluate the efficacy and biocompatibility of CO_3Ap by two *in vivo* studies.

Methods: CO_3Ap (300~600 mm) was fabricated by phase transformation based on dissolution-precipitation reaction using microporous low crystalline calcite granules as a precursor. The animal experimental protocols were approved by Institutional Animal Care and Use Committee of Hamri Co., Ltd. [Study A] Bone replacement of CO_3Ap was evaluated in beagle extraction sites. The third and fourth premolar extraction sockets of beagle (over 10 kg, male) were filled with CO_3Ap. After healing period of 12, 26, 39 and 52 weeks, histological evaluation was performed. [Study B] Histopathological evaluations in bone defect was performed using rabbits according to ISO 10993-6. CO_3Ap was implanted to the bone defect (φ5 mm×8 mm) created in femoral shaft of rabbit (over 18-week-old, male). After healing period of 4, 8 and 12 weeks, histological evaluation of the implanted site were performed.

Results: [Study A] CO_3Ap was replaced with newly formed bone. Marked difference was not observed between the testing periods for newly formed bone area. New bone area was ~10% lower than normal bone, which may be due to the remaining materials. [Study B] The results showed no evidence of inflammatory cell migration, no epidermal necrosis, no vacuolar degeneration of basal cell, no adnexal atrophy and vesicle formation of any samples.

Conclusion: CO_3Ap showed the potential of being an effective and biocompatible bone graft substitute which we could expect bone formation and replacement.

PR555

Blood absorption capacity of different xenograft bone substitutes

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Background and Aim: Nowadays, the most widely applied, as well as, extensively documented method for the bone augmentation is the combination of particulated xenografts with resorbable collagen membranes. However, when particulated grafts are used, mechanical stability can be compromised due to soft tissue pressure and can collapse the volume of the regenerated area. The introduction of the xenograft bone blocks may represent an alternative for the above mentioned drawbacks and the disadvantages of the autogenous bone blocks. In order to obtain predictable bone regeneration, some principles are crucial for the success of the procedure like the primary wound closure, angiogenesis, space creation/maintenance and stability of the initial blood clot or the implant. The objective of this in vitro study was to compare the blood absorption capacity of two commercial available collagenated xenograft block materials.

Methods: Two brands of xenograft block materials were used (Ace Surgical® and Osteobiol®). Five samples of each brand were analyzed, making a total of 10 observations. Human blood was used as the adsorption liquid for the present experiment. The time period, in which the block remains in contact with the blood, was measured with a stopwatch and the weight of each block was registered at 30 s (T1), 60 s (T2) and 5 min (T3). The xenograft blocks were evaluated according to their absorption capacity. Statistical analysis were performed using the ANOVA with Bonferroni post-hot test using Statgraphics 5.0® program.

Results: The absorption capacity of the biomaterials were statistical significant different ($p = 0.0000$). The Ace Surgical® absorbed significantly more blood than OsteoBiol® at T1, T2 and T3. The Ace Surgical® at T1 registered an increase of 93.49% of its originally weight, at T2 122.55% and at T3 157.07%. The OsteoBiol® at T1 increased 24.62%, at T2 29.73% and at T3 65.49%.

Conclusion: The Ace Surgical® absorbed significantly more blood than OsteoBiol®.

PR556

Changes in volume and density of autologous bone grafts after alveolar bone reconstruction

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Background and Aim: Autologous bone grafts provide the best clinical outcome in repair of maxillary bone defects for their osteogenic and osteoinductive properties. The use of corticocancellous bone grafts from the iliac crest is considered as a "gold standard" in reconstruction of extensive maxillary defects, deformities or alveolar bone atrophy. Literature analysis provides controversial and limited data concerning the early and long-term volumetric stability of autologous bone grafts. The aim of the study was to investigate the changes in volume and density of the autologous bone grafts from the iliac crest, based on the CT data analysis in early and late postoperative period after alveolar bone reconstruction.

Methods: The study involved 42 patients (age 38.3 ± 12 years) with alveolar bone reconstruction procedures with autologous bone grafts from iliac crest. The patients' condition was evaluated clinically and radiologically (CT) immediately after surgery, and in 6 and 12 month terms. The graft volume, the content of different bone types inside the graft and the radiographic density of the recipient area were determined by CT data analysis. Non-parametric statistics was applied to compare the differences in calculated parameters between different terms of observation.

Results: It was found that in postoperative period the bone grafts were exposed to intense resorption and remodeling with a decrease in volume by 65.1 ± 21.8% and increase in radiological density. The most intense resorption was observed during the first 6 months after surgery (45.6 ± 21.8%). The statistically significant correlation between the initial graft volume and the degree of its resorption ($r = 0.64$, $p < 0.05$) was found. Also, the increase in mineral density during remodeling was more pronounced in smaller grafts ($r = 0.76$, $p < 0.05$).

Conclusion: Autogenous bone grafts in postoperative periods after transplantation undergo significant resorption with some

increase in their mineral density. The bone graft remodeling process is associated with its initial volume and architectonics.

PR557

Clinical comparison between double flap incision, modified periosteal releasing incision and periosteal releasing incision for flap advancement in partially edentulous patients undergoing GBR: an RCT

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Background and Aim: GBR is a reliable method to augment insufficient bone volume for implant placement. Membrane exposure is a major complication which is avoided by tension free primary closure. Classically PRI is performed to advance the flap and it has the disadvantage of bleeding, swelling and pain. The aim of this trial is to compare DFI, MPRI & PRI flap advancement, postoperative pain & swelling in GBR procedures.

Methods: Three groups of participants (four patients in each group) undergoing GBR Using Ti-Mesh & Xenograft, flap advancement achieved using: Group A: DFI (Partial thickness manner, periosteum separated from flap to achieve advancement). Group B: MPRI (Periosteum is incised and separated bluntly). Group C: PRI. (Periosteum is incised at the base). Flap Advancement, postoperative Pain & swelling are recorded.

Results: *Pain and swelling* Data explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests. Kruskal Wallis test used to compare between tested groups for pain and swelling. Wilcoxon signed rank test used to compare between the follow-up periods. The three techniques did not show significant difference in terms of pain or swelling.
Advancement DFI showed the highest flap advancement (mm) compared to PRI and MPRI groups for mesial and Mid. And total

	Groups						p-value
	PRI Flap		DFI		MPRI Flap		
	Mean	SD	Mean	SD	Mean	SD	
Advancement							
Mesial	11.75[a]	1.26	17.25[b]	2.22	9.25[a]	2.22	0.001*
Mid	10.75[a]	3.30	17.00[b]	2.16	11.25[a]	4.11	0.045*
Distal	7.25	3.40	12.25	2.63	10.75	5.50	0.251 NS
Total	9.92[a]	3.26	15.50[b]	3.21	10.42[a]	3.87	0.001*

Conclusion: According to the number patients studied so far in the three groups, there was no significant difference between DFI, PRI or MPRI in terms of pain and swelling scores, However DFI varied significantly in terms of flap *Advancement* and hence tension free closure. The study will be continued on a larger sample size (10 patients in each group) and longer follow up to evaluate mesh exposure and the amount of bone gain clinically and radiographically.

PR558

Clinical, radiographic, and histologic evaluation of tutoplast-derived allograft for alveolar ridge preservation

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Background and Aim: After tooth loss, the edentulous alveolar ridge undergoes natural bone remodeling, which results in loss of alveolar ridge width and height. This physiological phenomenon leads to an atrophic alveolar ridge that may prevent adequate implant placement. Bone graft materials have been placed in extraction sockets in order to minimize dimensional changes after exodontia. Bone allografts have shown to promote more vital bone formation and leave less residual graft particles when compared to xenografts and alloplasts.

Methods: The aim of this study was to compare clinically, radiographically, and histologically two types of bone allografts for alveolar ridge preservation. Conventional freeze-dried bone allograft (FDBA) was compared to tutoplast-derived cancellous bone allograft (TCBA) 4 months post-implantation in a split-mouth design. Fifteen patients in need of symmetrical tooth extractions were randomly assigned into two groups: (i) Atraumatic extraction + TCBA (test) or (ii) Atraumatic extraction + FDBA. A long-lasting bovine pericardium absorbable membrane was used to cover grafted sockets and secured with mattress sutures. Core biopsies were obtained from every grafted site at 4 months. Clinical, histomorphometric and radiographic analysis were performed. Cone beam computer tomography (CBCT) images were captured immediately after extractions and at 4 months, prior to implant placement.

Results: No statistical differences were observed on any of the evaluated clinical and radiographic parameters. Two-sample independent t-tests were performed (Independent two-group Mann-Whitney U Tests) which can be more reliable than t-test for small sample sizes. Histological analysis demonstrated that TCBA treated sites resulted in more vital bone formation and less residual graft particles at 4 months than conventional FDBA treated sites. One implant failure was observed in the conventional FDBA group.

Conclusion: Conventional freeze-dried bone allograft (FDBA) and tutoplast-derived cancellous bone allograft (TCBA) equally effective for implant site preservation when placed in extraction sockets. However, TCBA results in better bone quality for future implant placement.

PR559

Comparisons and analysis of the clinical and radiological success of "FLEXBONE®" and "MONO CORTICAL®" graft materials applied by using the tunnel technique in implant planned atrophic mandibular crests

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Background and Aim: Allografts and alloplasts are graft materials that can be obtained in sufficient quantities with satisfactory clinical outcomes. The main factor in preventing