



## Efficacy Evaluation of a New Buccal Bone Plate Preservation Technique: A Pilot Study



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Twenty extraction sockets in 16 patients were included in this study. Ten were treated with buccal plate preservation (BPP, test group), which consisted of placing a bone graft overlying the buccal plate in a surgically created pouch, and 10 were left untreated (control). Pre- and postoperative differences in buccolingual dimension at the midpoint of the extraction area were calculated using study casts. Statistically significant differences were found between the test group (mean,  $0.85 \pm 0.75$  mm) and control group (mean,  $0.9 \pm 0.65$  mm,  $P < .5$ ). Clinically, BPP after extraction may help to maintain or augment the soft tissue appearance compared to nontreatment. (Int J Periodontics Restorative Dent 2011;31:67–73.)

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Extraction sockets are self-healing defects. In a relatively short period of time, the void left by the extracted tooth is filled with new bone.<sup>1</sup> However, this does not occur without side effects; the healing process may lead to resorption of the buccal plate of the socket and may jeopardize possible implant tooth replacement.<sup>2</sup> Although the degree of bone loss is not certain or constant, since it may vary among individuals and anatomical situations, it is well accepted that a large amount of alveolar width and height may be lost in the first 6 months following extraction.<sup>2</sup> It has also been noticed that bone resorption mainly affects the buccal plate,<sup>3,4</sup> which increases the risk for facial soft tissue recession.<sup>4</sup> Although osseointegration of the dental implant may be successful, an anterior implant restoration is often judged a failure on the basis of poor soft tissue appearance.<sup>5–8</sup>

Several techniques and a variety of biomaterials have been introduced over the years in an effort to overcome possible bone remodeling and resorption after extraction. These different procedures fall under the category of



**Fig 1** (left) A maxillary right first premolar was extracted atraumatically because of vertical fracture. The socket was debrided thoroughly to remove residual granulation tissue.

**Fig 2** (right) A periosteal elevator was used to carefully perform limited soft tissue dissection in a full-thickness manner to create a "pouch" on the facial aspect of the socket.



socket or ridge augmentation or preservation, which may include the use of particulate autografts, allografts, alloplasts, xenografts, and membranes manufactured from various materials, including those that are bioabsorbable or nonresorbable and naturally derived or synthetic.<sup>9-14</sup> Socket grafting is a popular procedure, yielding good results at the clinical level.<sup>9-14</sup> Histologically, though, unless a membrane is used, fibroencapsulation of the graft particles may be noticed, especially at the cervical level.<sup>14,15</sup> Also, it has been noted recently that placement of a bone graft in a fresh extraction wound delayed socket healing.<sup>16</sup> Guided bone regeneration, on the other hand, may enhance bone regeneration in the socket, but requires a more technique-sensitive procedure and a longer healing time for maturation of the graft before implant placement compared to the natural healing process.<sup>17</sup> In this pilot study, a novel approach to preserve the ridge after extraction is presented, aiming to avoid recession of the facial wall of the socket without interfering with the self-healing process of the extraction socket.

## Method and materials

Sixteen patients seeking treatment in two private dental offices participated in this study. Patients consisted of 10 women and 6 men with a mean age of 41.8 years (range, 19 to 70 years). All patients were medically healthy with no underlying systemic disease, as assessed by a medical history screening. All patients exhibited good oral hygiene, were nonsmokers, and had no contraindications for dental treatment. Informed consent was obtained prior to treatment. Based on clinical and radiographic findings, each patient had at least one hopeless tooth to be extracted. Teeth extracted for periodontal reasons and sockets without four intact walls were excluded from this study. All patients chose to have the extracted or missing teeth replaced by endosseous implants.

Twenty extraction sockets were included in this study, 10 treated with buccal plate preservation (BPP) and 10 left to heal naturally. Those receiving BPP had a bone graft placed overlying the buccal plate in a surgically created pouch.

## Surgical technique

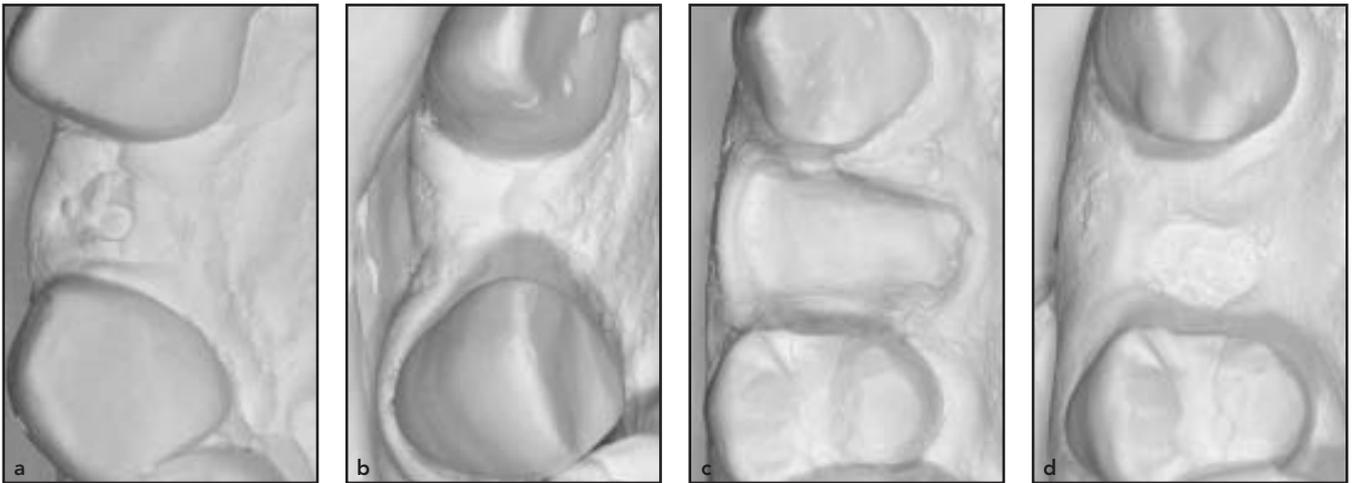
Under local anesthesia, the hopeless tooth was extracted atraumatically. The socket was debrided thoroughly to remove residual granulation tissue (Fig 1). The status of the ridge was then recorded by intraoral photography, and an alginate impression was taken. To create a pocket and place the graft in a position vestibular to the buccal plate, blunt elevation was performed using a small periosteal elevator. The procedure was performed carefully to avoid tearing of the soft tissue and continued until enough space was achieved to place the graft (Fig 2). Commercially available bovine bone xenograft (Geistlich) was rehydrated with sterile saline before use. To facilitate handling of the graft material, a sterile syringe was used to apply bone into the pouch. This process was repeated until a good filling of the pouch, mimicking root eminence, was achieved (Fig 3). Horizontal mattress sutures were used if needed to secure the graft in place. No attempt to position the flap coronally or achieve primary



**Fig 3** (left) Saline-rehydrated bovine bone xenograft was placed in the pouch overlying the buccal plate using a syringe. The bone graft material was compressed manually several times, and the process was repeated to achieve adequate filling of the pouch. The socket was left to heal with natural secondary intention.



**Fig 4** (right) Healing at 6 weeks (BPP patient). Clinical visualization and measurements revealed adequate healing of the bone graft and socket with optimal soft and hard tissue contours.



**Fig 5** Pre- and postoperative study casts: (a) preoperative and (b) postoperative casts of a patient who underwent natural healing and (c) preoperative and (d) postoperative casts of a patient who underwent BPP.

closure was made. Sutures were removed 1 week postsurgery, and endosseous implants were placed 6 weeks after extraction. At the time of implant surgery, photographs and impressions were taken (Fig 4). Enough bone width and height was present in all patients to allow implant placement.

### Measurements

Pre- and postoperative impressions were sent to a dental lab and study casts were fabricated (Fig 5). A dental technician blinded to the purpose of the study and the type of procedure performed measured the bucco-lingual dimension at the midpoint of the extraction area using a surgical caliper. Measurements were repeated three times on the casts and averaged to the nearest 0.5 mm. Differences between pre- and postoperative measurements were then calculated.



**Fig 6** (a) Preoperative and (b) post-operative occlusal view of a patient who underwent natural healing. Note the loss of buccolingual dimension.

## Results

Twenty extractions in 16 patients were performed. Patients were assigned randomly to either a BPP procedure (test) or natural healing (control) (Fig 6). In the test group, the difference in buccolingual dimension ranged from  $-0.5$  to  $2.0$  mm (mean,  $0.85 \pm 0.75$  mm), while in the control group, the difference ranged from  $-2.5$  to  $0.0$  (mean,  $0.9 \pm 0.65$  mm) (Table 1). The differences were statistically significant ( $P < .5$ ). Clinically, sufficient bone was present in every patient to allow the placement of implants completely into the bone.

## Discussion

The periodic assessment of treatment outcomes is the hallmark of any clinical profession. The biologic process behind the healing of an extraction socket has been reviewed recently.<sup>3</sup> This led to the reevaluation of not only the use of immediate implant placement in fresh extraction sites, but also the use of osseous graft materials to preserve the natural architecture of the alveolus after extraction.<sup>3</sup> Mellonig and Towle<sup>18</sup> questioned whether intact extraction sockets were appropriate sites to test the bone growth-promoting

**Table 1 Patient demographics and pre- and postoperative buccolingual dimension measurements**

Patient	Age	Sex	Extracted tooth*	BPP	Natural healing	Preoperative dimension (mm)	Postoperative dimension (mm)	Difference (mm) <sup>†</sup>
1	70	F	26	X		14.0	16.0	2.0
			27		X	14.5	13.0	-1.5
2	36	M	16	X		14.5	15.0	0.5
3	19	F	17	X		13.5	14.5	1.0
4	65	F	24	X		10.5	10.5	0.0
5	70	F	15	X		11.0	10.5	-0.5
6	63	F	12	X		10.0	11.5	1.5
			22		X	10.0	9.0	-1.0
7	58	M	14	X		11.5	12.5	1.0
8	47	M	25	X		12.5	13.0	0.5
9	45	F	14	X		12.5	14.0	1.5
10	43	F	24	X		11.5	12.0	0.5
11	34	F	14		X	13.7	13.7	0.0
12	23	M	23		X	12.0	11.5	-0.5
13	52	F	33		X	11.0	10.0	-1.0
14	39	M	25		X	11.0	10.5	-0.5
15	50	F	46		X	15.5	14.5	-1.0
			37		X	15.5	15.5	0.0
16	42	M	14		X	14.0	12.5	-1.5
			16		X	16.5	14.5	-2.0

F = female; M = male.

\*FDI tooth-numbering system.

<sup>†</sup>Negative values indicate loss of buccolingual dimension.

activities of any graft material. They postulated that only two responses would occur in such self-healing defects: either the graft material would have no influence on the natural healing of the socket, or the graft material would impair the healing process. Consistent with the former possibility, test and control sites would yield the

same results; consistent with the latter, however, test sites would likely heal slower than control sites, with or without worse clinical outcomes. Within this conceptual framework, therefore, osseous grafting of intact extraction sockets may help maintain the space, but not necessarily enhance bone fill unless a complete

guided bone regeneration procedure with a membrane is performed<sup>17</sup> or slow the self-healing process of the socket.<sup>16</sup> In both instances, the clinical result is that a reentry procedure may be performed much later compared to those sites where no grafting procedures were performed.

BPP consists of placing a bovine xenograft labially to the facial bony plate of the alveolus in a surgically created pocket underneath the soft tissues. The rationale for this procedure is that the slow or nonresorbing particles of the bovine xenograft might be incorporated between the soft and hard tissues, thus enhancing the soft tissue appearance of the edentulous ridge. Bovine xenograft has been shown to have a very low resorption rate in many different sites. This may be regarded as less than ideal for future implant sites, but according to several authors, once incorporated in bone, the particles may help prevent resorption of the newly regenerated area in the long term (ie, in the sinus area).<sup>19,20</sup>

It has also been shown that in esthetic areas, regenerating the facial aspect of the buccal plate with nonresorbable membrane and bovine xenograft may prevent bone remodeling at the head of the implant, thus avoiding soft tissue recession and esthetic complications.<sup>21,22</sup> This consists of a complete guided bone regeneration procedure aiming to overbuild the bone around the neck of the implant in an attempt to avoid any possible bone resorption.

This new grafting technique tried to achieve similar results with a less invasive and technique-sensitive procedure for the provider and a less expensive one for the patient by preserving the alveolus appearance rather than undergoing augmentation after resorption has taken place. The preliminary results are encouraging, although the number of patients treated in this pilot study was limited.

## Conclusion

BPP may help maintain or improve the appearance and contour of the edentulous ridge after tooth extraction. Further investigations are warranted to understand the biology of the efficacy behind this technique and the factors that may influence it (ie, thickness of the buccal plate after extraction, the presence of contiguous teeth, and the type of bone graft with or without a membrane).

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