MANAGEMENT OF MAXILLARY ALVEOLAR PROCESS FRACTURES BY COMBINATION OF “OSTEON” AND “COLLA GUIDE” RESORBABLE MEMBRANE

Incidence of maxillofacial traumas is reported steadily increasing, maxillary fractures being extremely severe. Maxillary alveolar process (AP) and front teeth are traumatized more frequently than any other parts of the maxilla. Deprivation of teeth and AP post-traumatic flaw as well as loss of alveolar height not only create cosmetic defect but also complicate subsequent prosthetics of the patients. The work was initiated to assess efficacy of “Osteon”, an osteoplastic material, and “Colla Guide” resorbable membrane in prevention of AP post-traumatic flaws and deformities. To achieve the aim 41 patients (33 men and 8 women) aged from 18 to 45 with the comminuted fractures of maxillary AP emergently hospitalized at the Maxillofacial Surgery Department, Tashkent Medical Academy 2nd Clinic were examined and treated. The findings showed that the materials above can be considered as those to increase efficacy of the treatment, facilitating preservation of AP shape and AP crest height. In addition, preservation of bone tissue mineralization helps avoid risk of the bone wound inflammatory morbidity.

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Introduction

Today incidence of maxillofacial traumas is reported steadily increasing, maxillary fractures being extremely severe. Maxillary alveolar process (AP) and front teeth are traumatized more frequently than any other parts of the maxilla (Belchenko et al., 1998; Shamsutdinov et al., 2002). Maxillary fractures account for 3-18% of all facial skeleton injuries (Shamina, 1976; Adams et al., 2000). Generally, AP fractures are reported to take place in 9.7-76.9% of the injuries, frequently concomitant with the mandibular fractures (Bell et al., 1980; Bilaniuk and Zimmermann, 1984, Carlin et al., 1998). In 35.3% of cases AP fracture is found with the loss of teeth and bone cortex, prevailing in the front maxilla (Ippolitov at al., 2003, Kogan and Bogatov, 2004). Performing primary debridement surgeons often have to remove small bone fragments.

Deprivation of teeth and AP post-traumatic flaw as well as loss of alveolar height not only create cosmetic defect but also complicate subsequent prosthetics of the patients. Preservation of AP anatomical integrity aiming at prevention of post-traumatic alveolar crest deformity is an urgent problem in surgical dentistry. To restore bone defects various materials and methods can be used. The combination of “Osteon” and “Colla Guide” resorbable membrane is characterized with the biocompatibility with human organism causing no rejection. The work was initiated to assess efficacy of “Osteon” (Genoss Co., Ltd, Korea), an osteoplastic material, and “Colla Guide” resorbable membrane (Bioland, Ochang, Korea) in prevention of AP post-traumatic flaws and deformities.

Management of AP fractures in combination with pharmacological interventions helps avoid risk of complications. Kept in a bone wound “Osteon” stimulates formation of
secondary bone tissue. As a collagen, “Colla Guide” resorbable membrane stimulates formation of bone cortex.

We have used “Osteon” and “Colla Guide” resorbable membrane in the treatment of comminuted maxillary AP fractures due to the fact that the materials are not rejected by bone wound, the follow-up period shows no AP atrophy. In addition, the materials cause no adverse effects.

**Materials and methods**

We examined 41 patients (33 men and 8 women) aged from 18 to 45 with the comminuted fractures of maxillary AP. 27 people were traumatized at home, 10 patients undergoing out-door traumas, 4 subjects getting injuries during sporting events. Localization of maxillary AP traumas and types of dental injuries can be seen in a Table 1.

<table>
<thead>
<tr>
<th>Fracture localization</th>
<th>Patients (n)</th>
<th>Tooth injuries</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Complete dislocation of teeth with bone defect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incomplete teeth dislocation</td>
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<tr>
<td>Frontal maxilla</td>
<td>31</td>
<td>17±0.5</td>
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<tr>
<td></td>
<td></td>
<td>8±0.1</td>
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<tr>
<td></td>
<td></td>
<td>6±0.2</td>
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<tr>
<td>Premolars</td>
<td>8</td>
<td>5±0.1</td>
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<td></td>
<td></td>
<td>2</td>
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<td></td>
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<td>2±0.1</td>
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<tr>
<td>Molars</td>
<td>2</td>
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All patients were emergently hospitalized at the Maxillofacial Surgery Department, Tashkent Medical Academy 2nd Clinic. In 19 of 41 patients maxillary AP fractures were found with the mandibular ones, concomitant brain concussion being registered in 22 patients.

At admission in all patients primary debridement was performed. Following antiseptic wound treatment small bone fragments and teeth under local anesthesia with 2% lidocaine were repositioned. Teeth were fixed by means of flat splint.

We divided the patients into 2 groups. The 1st group included 20 controls to undergo conventional open wound management only, 21 patients with bone defects comprising the 2nd group, were to be managed by combination of “Osteon” and “Colla Guide” resorbable membrane. “Osteon” filled a bone wound, outer cortex being applied with “Colla Guide” resorbable membrane to be subsequently covered with mucoperiosteal flap fixed by interrupted suture by means of vicril 3.0 (Ethicon, Jonhson & Johnson, USA). The sutures were removed 8-9 days after.

To assess efficacy of the treatment above 6 months later X-ray densitometry was used to measure bone density and mineralization degree. An osteodensitometer (DENSITY, USA) was used to analyze and compare the findings with the standard reference. To compare the extent of bone demineralization in comparison with the normal one (2.79-3.57) the grading system including high (0.31-0.212), moderate (0.212-1.372) and mild (1.372-2.79) degrees is used.

**Results**

In all controls under conventional therapy, that is, those with open wound management (n=20) the first intention wound healing took place. No inflammatory complications were found. In assessment of these patients’ clinical condition presence of AP defects and deformities and dental arch were taken into account. In 4 (20%) patients of this group AP defect was observed, 12 (45%) patients had their outer cortex deformed, accordingly affecting the alveolar arch. In this group X-ray densitometry demonstrated mean bone density 1.293 ± 0.06 corresponding to moderate degree of bone demineralization.
In 21 patients managed with the combination of osteoplastic material and resorbable membrane the first intention wound healing was observed. Late term AP deformation was found in one patient only (4.7%). X-ray densitometry demonstrated demineralization degree closer to that of normal bone (mean bone density, 2.98 ± 0.05).

Discussion

Frontal maxillary AP fractures with the loss of teeth are those frequently registered. Deprivation of teeth and AP post-traumatic flaw as well as loss of alveolar height not only create a cosmetic defect but also complicate subsequent prosthetics of the patients. To restore bone defects various materials and methods can be used. Actually “Osteon” is a bone matrix, “Colla guide” resorbable membrane facilitating bone wound healing. These materials help improve bone defects in AP fractures restoring the alveolar crest height and shape.

The reexamination 6 months later showed that conventional management of AP fractures resulted in 65% post-traumatic deformity of the alveolar crest, complicating subsequent prosthetics. In addition flaws or deformations in the frontal maxillary AP caused a cosmetic defect. In these patients densitometry demonstrated moderate demineralization. In comparison, in 6 months AP deformations were observed only in 4.7% of patients managed with “Osteon” and “Colla Guide” resorbable membrane, bone tissue mineralization being closer to that in normal bone.

The findings suggest that “Osteon” and “Colla Guide” resorbable membrane facilitate preservation of the alveolar crest, uniformity of alveolar arch cortex and bone mineralization. The materials help restore bone tissue resulting in formation of the secondary osseous tissue to have no troubles in subsequent prosthetics of the patients.

Conclusion

Following primary debridement AP flaws and alveolar crest deformities can be seen in patients with maxillary AP fractures. Bone tissue demineralization is found to persist 6 months later, complicating subsequent prosthetics. “Osteon” and “Colla Guide” resorbable membrane are the materials to increase efficacy of the treatment, facilitating preservation of alveolar crest shape and height. In addition, preservation of bone tissue mineralization helps avoid risk of the bone wound inflammatory morbidity.

References