Case Report

Conservative Surgical Treatment of the Jaw Cysts in Children: Case Study of Five Patients

G Gurler, S Yilmaz, C Delilbasi, E Dilaver, E Yuzbasioglu, A Patir-Munevveroglu

In this case series, we present outcomes of conservative surgical approach to jaw cysts in children.

INTRODUCTION

Conservative surgical approach in children is the most preferred way to treat cysts and tumors in children to decrease morbidity and protect neighboring vital structures. Furthermore, thanks to conservative surgery, growth and development of the organs may not be adversely affected. Marsupialization is a conservative surgical treatment in which cyst wall is sutured to oral mucosa and contents of cyst are drained. As a result, intraluminal pressure decreases and bone regeneration is promoted around the cyst cavity. In decompression, a small window on the cyst wall is created and an obturator is inserted to this opening to establish a continuity between cystic cavity and oral mucosa. They also promote the spontaneous eruption of the involved tooth within the cyst when sufficient space for eruption exists. Some parameters such as patient’s age, gender, cusp depth, tooth axis, tooth angulation, interdental space, and impacted teeth size are used to predict possibility of eruption of the impacted tooth.

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CASE PRESENTATIONS

Five children (three girls and two boys) whose age ranged 9–12 years with no systemic disease, with a mean of 10 years, referred to our clinic for dental treatment. Lesions suspected of cysts were detected in routine panoramic radiographs [Figure 1A]. In clinical examination, three lesions (one mandible, two maxilla) showed buccal expansion but no sign of infection was found in any patient. Cone beam computerized tomography (CBCT) was taken for the evaluation of lesion borders and anatomic structures (tooth roots, inferior alveolar nerve, etc.).

Nine impacted permanent teeth were detected in six lesion cavities (two maxilla, three mandible). (Table 1)
A removable acrylic obturator was prepared and adjusted to the cyst window 2 weeks after the procedure [Figure 2A,2B]. Patients and their families were informed about how to rinse the lumen of the cyst with sterile saline solution twice a day through the opening of the cyst wall. Patients were recalled every 2 weeks for follow-up and for adjustment of the obturator. Eruption of the impacted teeth and resolution of the cyst lesions were evaluated with panoramic radiograph monthly. By using preoperative and follow-up panoramic radiographs the following criteria were assessed: resolution of the cystic lesion, eruption of the impacted teeth, the relation between angulation of the impacted teeth and eruption, the relation between depth of the impacted teeth and eruption.

Radiographic landmarks were recorded as Fuji et al. [4] described: cusp depth (the distance of the central cusp tip of the cyst-associated tooth from the line that passes the cement–enamel junction of the adjacent teeth) [Figure 3A], angulation (the angle between the impacted tooth axis and the bisector of both adjacent tooth axes) [Figure 3B], cyst size (the area size of the cyst in mm$^2$) [Figure 3C]. Complete marsupialization period ranged 20 weeks to 60 weeks with a mean of 44.2 weeks. (Table 2) Gradual resolution of cystic lesions and complete or partial eruptions of the impacted teeth at the end of the treatment were observed [Figure 4]. Six permanent teeth in five cases erupted uneventfully. Eruption of the two impacted teeth was managed by orthodontic treatment. One tooth in cystic lesion had to be extracted. We have not encountered any complications except in one case, the tooth within the cystic cavity had to be extracted during marsupialization period.

Two cases needed orthodontic alignment after eruption of impacted teeth. While the mean cusp depth of spontaneously erupted teeth was 5.9 mm, the mean cusp depth of teeth which were erupted orthodontically was 4.2 mm. Mean angulation of spontaneous erupted teeth and orthodontically erupted teeth 19.8° and 33°. [Table 3]

In all our cases, we used obturators which were prepared...
from acrylic. All obturators permitted tooth eruption and enabled the reduction of the cyst cavity. However, the extension of the acrylic plates in the cyst cavity needed adjustment for tooth eruption and cavity shrinkage.

**DISCUSSION**

Marsupialization and decompression are conservative surgical techniques and have been widely performed for the treatment of jaw cysts. Advantages of marsupialization are: it reduces the cyst size; minimizes the risk of damage to important anatomical structures such as inferior alveolar nerve and maxillary sinus; minimizes the damage to bone tissue; stimulates osteogenesis; and promotes the eruption of the involved teeth. On the contrary, the disadvantages are: patient discomfort which is prominent at the early stages of

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**Table 2: Evaluation of the criteria for each tooth**

<table>
<thead>
<tr>
<th>Impacted tooth</th>
<th>Angulation (°)</th>
<th>Cusp Depth (mm)</th>
<th>Diagnose</th>
<th>Cyst Size (mm²)</th>
<th>Period (week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>29</td>
<td>0</td>
<td>Keratocyst</td>
<td>527,91</td>
<td>56</td>
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<tr>
<td>#2</td>
<td>51,1</td>
<td>13,18</td>
<td>Dentigerous</td>
<td>240</td>
<td>60</td>
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<tr>
<td>#3</td>
<td>41,7</td>
<td>0</td>
<td>Dentigerous</td>
<td>277,57</td>
<td>20</td>
</tr>
<tr>
<td>#4</td>
<td>13,2</td>
<td>0</td>
<td>Dentigerous</td>
<td>391,34</td>
<td>42</td>
</tr>
<tr>
<td>#5</td>
<td>62</td>
<td>3,6</td>
<td>Dentigerous</td>
<td>240</td>
<td>60</td>
</tr>
<tr>
<td>#6</td>
<td>2,9</td>
<td>7,16</td>
<td>Dentigerous</td>
<td>277,57</td>
<td>20</td>
</tr>
<tr>
<td>#7</td>
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<td>1,63</td>
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<td>391,34</td>
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<tr>
<td>#8</td>
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<td>11,69</td>
<td>Dentigerous</td>
<td>534,07</td>
<td>43</td>
</tr>
<tr>
<td>#9</td>
<td>29,5</td>
<td>5,09</td>
<td>Dentigerous</td>
<td>534,07</td>
<td>43</td>
</tr>
</tbody>
</table>
Some authors advocate enucleation with curettage, the others state that odontogenic keratocyst can completely disappear for some cases to control eruption of involved teeth and pathological tissue remains in situ.\textsuperscript{4,8}

Dentigerous cysts are the most commonly encountered among all developmental odontogenic cysts of the jaws. Different treatment options for dentigerous cysts are enucleation, curettage, decompression, marsupialization, and resection with or without continuity defect. Preservation of the impacted teeth and prevention of the vital tissues from surgical damage are desired in young patients, hence marsupialization can be the first choice of treatment. Koca et al.\textsuperscript{9} and Ziccardi VB et al.\textsuperscript{10} stated that marsupialization is more efficient than other treatment options particularly in young patients by preserving tooth in cyst cavity and by promoting tooth eruption. However, Hyamoto et al. reported that 30% impacted premolars associated with dentigerous cyst did not erupt spontaneously by enucleation and these teeth had to be removed surgically.\textsuperscript{2,11} Koca et al. and Miyawaki et al. stated that impacted teeth associated with dentigerous cyst can be erupted orthodontically when sufficient space exist.\textsuperscript{2,9,12} Complete resolution of the cystic lesions were achieved in all of our cases, six of nine impacted teeth within the cystic lesions erupted spontaneously, two of them were erupted orthodontically, and one had to be extracted. These three teeth had severe angulation.

There is a dilemma whether odontogenic keratocyst [keratocystic odontogenic tumor (KCOT)] can be treated with marsupialization. Although some authors advocate enucleation with curettage, the others state that odontogenic keratocyst can completely disappear after marsupialization alone.\textsuperscript{7} Tabrizi et al. evaluated 13 patients with keratocyst who were treated with marsupialization.\textsuperscript{13} They followed up patients for 60 months. During this period, they declared no sign of recurrence. Johnson et al. reviewed 2736 published articles regarding management and recurrence of KCOT.\textsuperscript{14} They found that recurrence rate of enucleation alone, enucleation with adjunctive measures (other than Carnoy solution), and enucleation with Carnoy solution were 25.6%, 30.3%, and 7.9%, respectively. Furthermore, recurrence rate of marsupialization alone and marsupialization with adjunctive therapies were 4.8% and 15.8%, respectively. As a conclusion, they recommended that large KCOT is best treated with a two-stage approach being marsupialization followed by enucleation and adjunctive measures. In this present report, keratocyst was diagnosed in only one patient and managed successfully with marsupialization without performing second stage surgery. During the first-year follow-up, no sign of recurrence was observed.

Fuji et al. carried out a study on prediction of the eruption of impacted teeth associated with dentigerous cyst. They found that as angulation and cusp depth increase, the success rate decreases.\textsuperscript{4} In our case series, teeth that did not erupt had higher angulation degrees than the spontaneous erupted teeth. However, the depth of the tooth in the alveolar bone did not affect eruption.

Several kinds of obturators and appliances are being used in decompression of the cysts. In all our cases, we used removable acrylic obturators. All obturators permitted tooth eruption and enabled the reduction of the cyst cavity. The extension of the acrylic obturator enables tooth eruption and cavity shrinkage.

**CONCLUSION**

Children have high capacity of bone regeneration; therefore, conservative surgical treatment enables spontaneous tooth eruption. Several factors should be considered to predict eruption and close follow-up is mandatory to decide the need for orthodontic treatment.

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**