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Does Spontaneous Bone Healing Exist Following the Enucleation of a Jaw Cyst?

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Abstract

Objective: This study evaluated natural bone healing after cystectomy without the aid of a bone graft using clinical examination and panoramic radiographs. **Materials and Methods:** We recruited ten individuals who presented with cysts in their jaws. Eight females and two males, mean age 38 years old. All patients were treated by conventional enucleation technique without bone graft under local or general anaesthesia. **Results:** After six months, nine cases showed 50-70% spontaneous bone healing for cyst cavity size while one case showed 20% bone healing with parts of radiolucency less than half of the bony defect. **Conclusion:** Enucleation of bone cysts without bone grafts remains the efficient tool in the treatment of jaw cysts. Bone regeneration occurs in most cases. The postoperative complications are rare and temporary.

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Introduction

A cyst can be defined as a pathological cavity lined by epithelium and outer connective tissue. The content of the cyst may be fluid, gas or semisolid material other than pus [1]. Cyst expansion occurs by the hydrostatic pressure of the fluid. Jaw cysts can be classified into odontogenic and developmental types. Most cysts occur in the maxilla or mandible due to prevalence of rest epithelial remnants [2,3]. Most jaw cysts are asymptomatic and radiolucent radiographically. Several treatment options exist depending on the type, size, localization and recurrence potential of the cyst. The methods of treatment of jaw cysts includes [4-6]:

1. Decompression of cyst.
2. Enucleation of the cyst lining completely with primary closure of the incision.
3. Complete enucleation of the cyst and leave the wound open to heal secondarily.
4. Marsupialization.
5. Make a small window in the cyst lining with the involvement of the cyst plug to maintain the opening.
6. Perform cyst enucleation together with exposure of antrum and nasal antrostomy.
7. Use an extraoral approach for enucleation and wound closure.
8. leave the cyst without any intervention.
9. Marsupialization followed by enucleation.
10. Use adjuvant therapy such as Carnoy's solution.
11. New techniques have been introduced such as the use of an endoscope or microscope in enucleation and the injection of impression material inside the cyst before enucleation [7].

Enucleation is the ideal treatment for cysts, associated Rad with the lowest recurrence rate [8]. The healing of bone after cystectomy depends on the extent of tissue damage, presence of periosteum, size of cyst and age of the patient. The cysts can be classified radiographically in the follow-up period as in Table 1 [9,10].

The objective of this study was to record the percentage of new bone formation after enucleation with primary closure of bone cysts and evaluate any postoperative complications.

Type	Classification	Description
I	Healed	Cystic cavity is obliterated by new bone formation with or without small (less than 1cm) with radiolucency regions
II	Healing with defect	Presence of radiolucency regions less than 50% of bony defect width
III	Persistent cyst	The radiolucent region is more than 50% width of the bony defect and is surrounded by a thin cortex
IV	Recurrent cyst	Recurrence of cyst in previously filled defect or increased width of residual radiolucency.

Table 1. Radiographic classification of cysts.

Patients and Methods

Between March 2017 and June 2022, ten patients presented with jaw cysts were included in this study (Table 1). Eight females and two males, mean age of 38 years old. All patients were treated by enucleation in a clinic or Department of Oral and Maxillofacial Surgery at AL-Ramadi Teaching Hospital, Al-Anbar, Ramadi. Seven cases were in the mandible while three cases were in the maxilla. The following parameters were recorded: patient age, sex, cyst location, duration and clinical features at presentation, laboratory tests (bleeding profile and viral screen), imaging (periapical, panoramic radiograph), the surgical treatment and complications. The most common clinical feature is painless swelling. The swelling grew slowly until it became noticeable, with a history of swelling lasting four months on average. A preoperative radiograph was taken. Fine needle aspiration cytology was conducted in ten cases to exclude vascular lesions. The healing percentage on the radiograph is the percentage of new bone formation density relative to cyst cavity size.

Decompression of large cyst to ensure complete removal of cyst wall. The cystic cavity was curetted, and in cases of a keratocyst an enucleation with carnoy solution was done to prevent the recurrence. The affected tooth was extracted with the preservation of vital structures such as the inferior alveolar nerve. Primary wound closure was performed. Evaluation of complications was recorded during the follow-up periods one week, one month, and six months.

Patient	Age	Sex	Classification of cyst	Type of jaw	treatment	Recurrence
1#	33	f	Dentigerous	Mandible	Enucleation	no
2#	28	f	Radicular	Mandible	Enucleation	no
3#	45	m	Keratocyst	Maxilla	Enucleation	no
4#	35	f	Glandular	Maxilla	Enucleation	no
5#	44	m	Radicular	Mandible	Enucleation	no
6#	35	m	Radicular	Mandible	Enucleation	no
7#	40	m	Radicular	Mandible	Enucleation	no
8#	26	f	Dentigerous	Mandible	enucleation	no
9#	33	m	Radicular	Maxilla	Enucleation	no
10#	32	f	Radicular	Mandible	Enucleation	no

Table 1. Patients included in this study.

Results

All cases were healed by primary intention; wound dehiscence was observed in one patient. All wounds showed no evidence of acute infection. A single case had nerve paresthesia which improved after 1 month. Panoramic radiographs were evaluated for all cases. The postoperative computerized evaluation of the radiographs revealed an increase in bone density and high healing percentage in the immediate postoperative period and after six months (Table 2).

Type	CASES	Healing %
I	9	50-70%
II	1	20%
III	0	0
IV	0	0

Table 2. Radiographical types of cysts in the follow-up period.

Discussion

In this study most cases occurred in the mandible, periapical cyst mostly involved the anterior maxilla while other odontogenic and developmental cysts mostly involve the mandible. Jaw cyst enucleation was performed without the use of graft material and ensure complete removal of the cyst lining. The cystic cavity should be less than four cm in greatest dimension to ensure spontaneous bone ossification [11-13]. Nyimi et al. reported that residual cystic cavities less than 4 cm can be ossified completely within 24 months post-enucleation [11]. Regarding bone healing percentage, this study reports 50-70% healing after six months. Previous work [14] determined that the overall rate of natural bone regeneration was 88.5% at least six months after the removal of the cyst without the use of bone grafts. Furthermore, they found that the kind of cyst did not have an impact on the rate of healing. Other studies reported that sufficient spontaneous bone healing occurs after enucleation even in large cysts [15-18]. Age is important as spontaneous bone regeneration is better in younger people up to 30-33 years old [19]. Spontaneous bone ossification is impaired in elderly patients as well as in circular defects, and bicortical or anterior maxilla defects [20]. One of the considerations is that the surgeon should keep the periosteum and bone walls intact even if they are thin layers because they regard sources for osteogenesis [21]. The surgical approach should be made high in the buccal vestibule to preserve bone walls around the cystic cavity because the surgical approach through the alveolar crest will interrupt the blood supply of periosteum and the impair the height of the alveolar ridge [22]. The most critical point for regular osteogenesis is the preservation of the periosteum and bone walls [23,24]. Considering bone ossification, previous work [25] showed that complete jaw regeneration occurs after one-year post-enucleation and up to four cm defects. Hence, almost larger defects complete bone healing can be expected after two years. There were few postoperative complications. Recurrence was not observed in all cases which is lower than that in the literature [11-25].

Conclusion

Enucleation of bone cysts without bone grafts remains an efficient tool in the treatment of jaw cysts. Bone regeneration occurs in most cases and fills up to 50-70% of defect size after six months if the periosteum and walls are saved for osteogenesis. Postoperative complications were few and temporary with no recurrence.

Ethical approval

The ethical concerns were accepted by the Medical Ethics Commission of the Ministry of Health of Iraq. All participants provided written informed consent to participate in the study.

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