Journal of Oral Hygiene & Health

Jiang Q, J Oral Hyg Health 2022 , 10:8

Research Article Open Acces

Application Study of Enucleation Combined with Guided Bone Regeneration in Small and Medium-Sized Odontogenic Keratocyst

Yiting Cao[1,4*], Yubo Wu[3,4*], Qinghua Gu[3,4], Qian Jiang[2,4]

[1]*Department of Pediatric Dentistry, Shanghai Jiao Tong University School of Medicine, China*
[2]*Department of Oral Surgery, Shanghai Jiao Tong University School of Medicine, China*
[3]*Department of Prosthodontics, Shanghai Jiao Tong University School of Medicine, China*
[4]*Department of Stomatology, Shanghai Jiao Tong University, China*

ABSTRACT

To observe the clinical effect of guided bone regeneration (GBR) in repairing bone defect after enucleation of small and medium-sized odontogenic keratocyst. 13 patients with odontogenic keratocysts were treated in the Department of Oral Surgery, Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine. 11 cases were diagnosed as apical cysts, 1 case was diagnosed as primordial cyst, 1 case was diagnosed as dentigerous cyst. All cases were treated with the same method of enucleation combined with GBR. Three to four months after operation, the boundary between the implant site and the surrounding normal stroma was not obvious in patients with small-sized odontogenic keratocyst . The patients with tooth defect were treated with implant after 6 months. For the patients with medium-sized odontogenic keratocyst, the density of the center of the implant area was close to the normal mass at 6 months after operation, and there was a clear boundary between the periphery of the implant area and the normal mass. The boundary between the periphery of the implant area and the normal mass was blurred at 8 ~ 9 months after operation. Patients with tooth defect were treated with implant s at more than 6 months after operation. The application of odontogenic keratocyst enucleation combined with GBR can shorten the time of osteogenesis, increase the amount of new bone formation, reduce complications, and improve the quality of life. It has a good application prospect in the treatment of odontogenic jaw cyst. It is worthy of clinical application.

Key words: Enucleation; Guided bone regeneration; Odontogenic keratocyst

Introduction

Odontogenic keratocyst is a cavity containing liquid, semifluid or gaseous components, which is usually derived from odontogenic tissue or epithelium or residual epithelium [1]. The incidence rate of odontogenic keratocyst is 10.7% (A United States study on oral biopsies from a dental school) [2]. With the development of the disease, it can lead to bone destruction, absorption or displacement of adjacent teeth [3]. Clinically, odontogenic keratocyst can be divided into root cyst, primary cyst, dentigerous cyst and calcification cyst [4]. Conventional surgical curettage is mostly used in clinic, and cysts are removed at one time. The disadvantage is that it may cause pathological fracture or damage of adjacent tissues [5]. For larger jaw cysts, fenestration and decompression should be performed first, and then the second stage curettage should be performed when the cyst cavity shrink to the drainage mouth, in order to reduce the recurrence rate [6]. The mechanism of healing after enucleation of jaw cyst is autogenous blood filling bone cavity, coagulation, organization and organization. However, the healing time is longer. Some studies have shown that the average healing time of the defect caused by small jaw cysts is 1 year, while that of larger jaw cysts is 2 ~ 5 years [7,8]. In recent years, with the rapid development of oral materials and the transformation of the treatment concept of jaw cysts, more options are provided for the postoperative bone defect of jaw cysts. Guided bone regeneration (GBR) is to place biomaterials in the bone defect, and then use biofilm to separate the proliferative soft tissue and the slow growing bone tissue to maintain the space for bone regeneration, which is widely used in the field of implantology [9]. In view of increasing bone width and height through GBR technology, the purpose of this study was to observe the clinical effect of GBR in repairing bone defect after enucleation of odontogenic keratocyst.

Materials and Methods

General information

From June 2018 to September 2020, 13 patients with odontogenic keratocysts were treated in the Department of Oral Surgery, Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine. All these healthy adults without hypertension, heart disease, diabetes and other systemic diseases were selected. The diagnosis was based on the final pathological results. 11 cases were diagnosed as apical cysts, 1 case was diagnosed as primordial cyst, 1 case was diagnosed as dentigerous cyst. The lesions were located in the maxilla in 7 cases, and in the mandible in 6 cases male in 7 cases, female in 6 cases, aged from 25 to 61 years old (37.2 ± 11.1 year-old) (Table 1).

Surgical methods

Cyst enucleation: generally, trapezoidal or triangular flap gingival sulcus incision is used. After mucoperiosteal flap elevation, an anterior vertical releasing incision was provided for optimum visualization

***Corresponding author:** Qian Jiang, Department of Oral Surgery and Stomatology, Shanghai Jiao Tong University School of Medicine, China, E-mail: jiangqian0720@hotmail.com

Citation: Jiang Q, Cao Y, Wu Y, Gu Q. (2022) Application Study of Enucleation Combined with Guided Bone Regeneration in Small and Medium-Sized Odontogenic Keratocyst. J Oral Hyg Health.10:329

Received: 02-August-2022, Manuscript No. JOHH-22-501; **Editor assigned:** 04-August-2022, PreQC No. JOHH-22-501(PQ); **Reviewed:** 18-August-2022, QC No. JOHH-22-501; **Revised:** 25-August-2022, Manuscript No. JOHH-22-501(R); **Published:** 31-August-2022, **DOI:** 10.4172/2332-0702.1000329

and sharp dissection using a pair of scissors was done superficial to the cystic wall in order to separate the mucoperiosteal flap without compromising its integrity. While the cystic lesion was identified and enucleated in total, mild adhesions to the lingual mucoperiosteum were released through blunt dissection using the surgical curette. The cyst was enucleat and sent to pathology during surgery. Treatment of bone cavity: The cyst tissue was scraped off completely, the cavity was washed with a large amount of normal saline, and the cavity was ground intermittently with a planter at 3000r / min. GBR: The residual defect left behind by the cystic lesion was then filled with a xenograft bone (Bio-Oss, Geistlich Pharma, Princeton, NJ, USA) soaked in sterile normal saline and covered by a resorbable collagen membrane (RCM) (Bio-Gide, Geistlich Pharma, Princeton, NJ, USA). The coverage was about 3 mm from the cyst surface to the defect area. The mucoperiosteal flap was reapproximated and closed with Vicryl 4-0 interrupted sutures (Polyglactin 910, ETHICON, Somerville, NJ, USA) (Figure 1).

Case	Sex	Age (years)	Signs and symptoms	Location	Imaging examination		**Treatment modality**
					Impacted Tooth	Cyst diameter (cm)	
1	F	25	Painful mass	Mandible	46,47	1.6x1.0	46 extracted+enucleation+GBR
2	F	39	Pain	Maxilla	12,11,21,22	3.2x1.5	12,11,21,22 extracted+enucleation+GBR
3	M	31	Jaw expansion	Mandible	37,38	2.5x1.1	37,38 extracted+enucleation+GBR
4	M	24	No	Mandible	35,36	1.3x0.8	35 extracted+enucleation+GBR
5	M	29	Painful mass	Mandible	35,36	1.3x1.2	36 extracted+enucleation+GBR
6	M	42	No	Maxilla	11,12	2.1x1.2	enucleation+GBR
7	F	61	Swelling	Mandible	31,32,41,42	3.4x1.5	enucleation+GBR
8	M	40	Swelling	Maxilla	11,21,22,23	3.3x1.7	21,22 extracted+enucleation+GBR
9	M	50	Painful mass	Mandible	31,32,41,42	3.8x3.2	enucleation+GBR
10	F	31	Pain	Mandible	35,36	1.0x0.8	36 extracted+enucleation+GBR
11	M	21	No	Maxilla	11,12	2.8x2.2	enucleation+GBR
12	M	45	Jaw expansion	Mandible	31,32,41,42	3.0x2.6	enucleation+GBR
13	F	38	Pain	Maxilla	15,16	3.2x3.0	16 extracted+enucleation+GBR

Table 1: Odontogenic Keratocyst case diagnosis (37.2 ± 11.1 year-old)

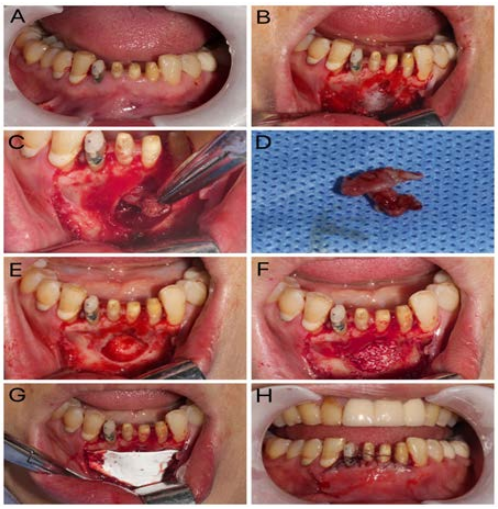

Figure 1:

A. Preoperative intraoral conditions

B. Trapezoidal flap gingival sulcus incision, exposed bone surface

C. Cyst enucleation

D. Cyst sample

E. Bone cavity

F. Implanted bone powder (Bio-Oss, Geistlich Pharma, Princeton, NJ, USA)

G. Overed by a resorbable collagen membrane (RCM) (Bio-Gide, Geistlich Pharma, Princeton, NJ, USA)

H. Suture

Postoperative management

Antibiotics were given intravenously to prevent infection for 1 ~ 2 days after operation. Gargle was used to keep oral hygiene. The suture was removed 10 days later. After 1 month, 3 ~ 4 months, 6 months, 8 ~

9 months and 12 months, CBCT was performed to check the healing of the defect area.

Results

Operation condition

The range of incision should be determined according to the imaging examination before operation, combined with imaging and clinical conditions, all patients had the destruction of the bone plate. Among the 13 patients, 12 patients were operated through the maxillobuccal gingiva (CBCT showed that the labial or buccal plate was damaged), and 1 patient was operated through the palatal median mucinous membrane (CBCT showed that the palatal plate was damaged and the labial plate was intact). Trapezoidal incision was used in 11 cases, and angular-shaped incision was used in 2 cases because the lesion was located in the posterior molar area.

Treatment of diseased teeth

Before operation, there were 11 cases of root canal therapy for the diseased teeth and their apices in the cystic cavity, 3 cases of the root canal therapy without root canal treatment, and 8 cases of the diseased teeth which were not worth to be extracted. There were 2 cases of root canal therapy after operation. So far, 4 cases have completed implant restoration of missing teeth.

A photographic observation on the healing of cystic cavity

The maxillofacial cysts had caused the destruction of the labial (buccal) or palatal plates, the maximum diameter of which was 1.0 cm-4.0 cm. Among them, small-sized lesions (≥ 1.0cm, ≤2.5cm) were found in 6 cases, medium–sized lesions (> 2.5cm, < 4.0cm) were found in 7 cases. Three to four months after operation, the boundary between the implant site and the surrounding normal stroma was not obvious in patients with small-sized lesions (Figure 2). The patients with tooth defect were treated with implant. For the patients with median-sized lesions area, the density of the center of the implant area was close to the normal mass at 6 months after operation, and there was a clear boundary between the periphery of the implant area and the normal mass. The boundary between the periphery of the implant area and the normal mass was blurred at 8 ~ 9 months after operation. For medium–sized lesions, the patients with dentition defect were treated with implant repair for 8 ~ 9 months (Figure 3).

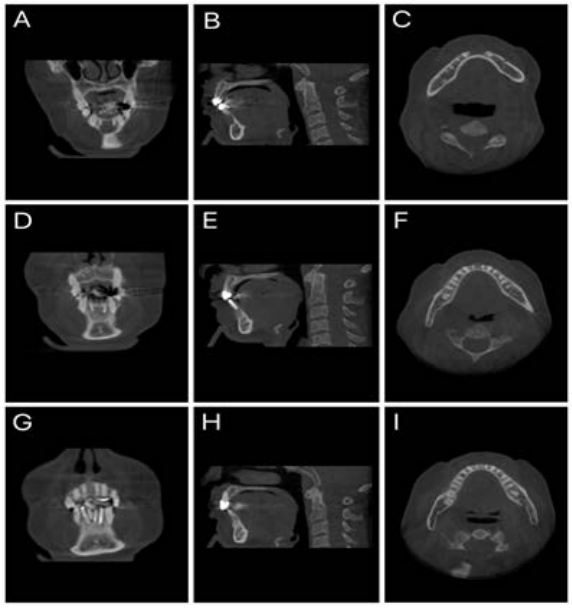

Figure 2:

A,B,C - Preoperative imaging

D,E,F - The imaging of one month after operation

G,H,I - The imaging of three month after operation

A,D,G - Coronal plane

B,E,H - Sagittal plane

C,F,I - Horizontal plane

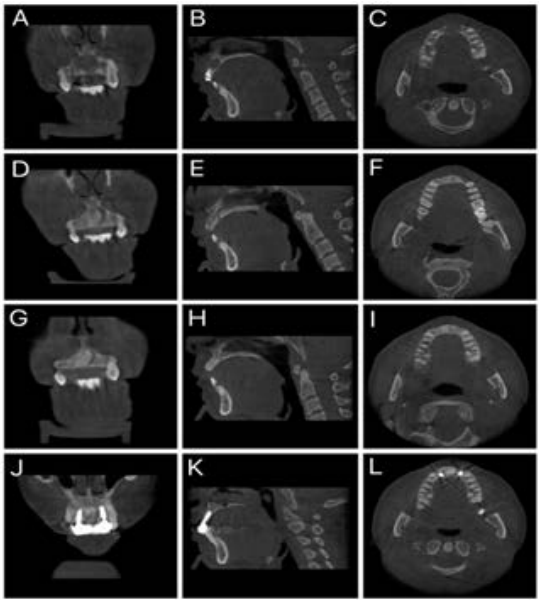

Figure 3:

A,B,C - Preoperative imaging

D,E,F - The imaging of three month after operation

G,H,I - The imaging of six month after operation

J,K,L - The imaging of nine month after operation, implant surgery

A,D,G,J - Coronal plane

B,E,H,K - Sagittal plane

C,F,I,L - Horizontal plane

Clinical observation of postoperative treatment effect

The immediate postoperative period was uneventful, and the surgical wound healed remarkably well. The patients were very satisfied with the operation. Pathological examination supports preoperative diagnosis. Follow-up examinations at 1 month, 3 months 6months 9 months and 12 months after cyst enucleation and guided bone regeneration revealed no clinical recurrence of the lesion.

Discussion

Jaw cyst is a common cause of jaw defect. For the defect of jaw cyst after enucleation, the treatment idea at home and abroad is not very unified. In the past, most of the methods used were tissue self-healing. Chiapasco M et al evaluated the spontaneous bone healing after enucleation of large mandibular cysts with a computed analysis of postoperative panoramic radiographs which showed mean values of reduction in size of the residual cavity of 12.34% after 6 months,

43.46% after 12 months, and 81.30% after 24 months, and increase in bone density was 37% after 6 months, 48.27% after 12 months, and 91.01% after 24 months [10]. Rabin Chacko et al evaluated the spontaneous bone regeneration after enucleation of jaw cysts (The diameter is 1.4cm-15cm) with a computed analysis of postoperative panoramic radiographs, which showed mean values of reduction in size of the residual cavity of 25.85% after 6 months, 57.13% after 9 months, 81.03% after one year and 100% after two year [7]. X Li et al used CBCT to explore the natural outcome of jaw defect after curettage of jaw cyst. CBCT images showed that the cytoplasm around the cyst was regenerated and reconstructed, and the cyst cavity was gradually reduced. The formation rate was different with the size of the original capsule, which was maintained at about 50% and 80% at 6 months and 12 months after operation [11].

In recent years, with the emergence of high-quality biomaterials, a large number of studies have been carried out on the treatment of jaw lesions with exogenous implant materials as filling materials. At present, the commonly used xenogeneic bone meal in clinic mainly comes from cattle, such as Geistlich Bio-Oss® and so on. Kim et al conducted a follow-up observation on 20 patients with cysts filled with xenogeneic bone meal materials after curettage, and found that there were more new bone formation 3 months after operation [12]. Tonetti et al applied the material to the treatment of alveolar defect caused by periodontal disease, and the results also showed that the xenogeneic bone meal had good bone-forming ability. Although these allogeneic materials are lack of active parts, such as osteoblasts, which do not have the ability to induce bone formation, their porous structure can guide bone tissue regeneration [13]. XN Yin et al found that after curettage of cyst with Geistlich Bio-Oss®, new bone formation was found in the defect area 1 month and 3 months after operation, and bone integration occurred 6 months later [14]. Our study also found that after curettage combined with GBR for the treatment of Odontogenic keratocysts with small lesion area, the defect area healed well 3~4 months after operation, which was similar to the surrounding normal density, and the boundary between the two was not clear. After enucleation combined with GBR, the defect area healed well 6-8 months after operation, which was similar to the surrounding normal density. It is suggested that this treatment method has a definite effect on promoting the healing of maxillofacial cyst after operation. Compared with the simple enucleation method, the time of osteogenic was significantly shortened. For patients with cyst extraction and tooth extraction at the same time, it can shorten the time of tooth formation, implant the missing teeth as soon as possible, and reduce the course of disease. This is particularly important for patients with anterior teeth cyst. Maxillary anterior tooth area is an important oral aesthetic area, which is exposed by lip tissue in the maximum movement state. The loss of teeth in this area not only causes the loss of function of the missing tooth area, but also has a significant impact on the facial appearance, language, pronunciation and mental health of patients. Studies have shown that the natural healing time of large bone defects after cyst surgery takes 2-5 years, and there may be insufficient bone height and width, which brings great challenges for later implantation. Therefore, how to shorten the time of missing teeth and provide sufficient bone for implant has become an urgent problem. In our study, a 50-year-old female patient presented with residual roots of 12, 11, 12, 22. CBCT showed that the size of the cyst in the area of #12-22 was 29.8 * 21.3 mm, and the buccal and lingual bone walls were absorbed. At the follow-up visit 6 months after #12,11,21,22 extraction + cyst enucleation + GBR, it was found that the bone mass in the edentulous area and the buccal alveolar bone fullness were well recovered. CBCT showed that the width of alveolar bone and the height were well. Then, implant operation was performed at #12 and #22 sites, and the initial stability of the implants was greater than 35N, so immediate repair was carried out (Fig 3 and Figure 4). This greatly shortens the time of missing teeth and the satisfaction of patients is high. At present, five cases of missing teeth in cyst area have been repaired by implant, which significantly shortens the time of missing teeth, and the patients are satisfied.

Figure 4:

A. Six months after cyst enucleation combined with GBR

B. Nine months after cyst enucleation combined with GBR, implant surgery and immediate restoration

All 13 patients were treated with surgical enucleation and primary bone defect repair using GBR with xenograft and resorbable collagen membrane, along with a recurrence-free follow-up period. There was no infection after bone grafting. The possible reasons may be: 1) after bone grafting, biomaterial scaffolds play an important role in the regeneration of mandible. The complete filling of biomaterial scaffolds in the capsule cavity is conducive to the blood clot to stabilize in the defect area, and then promote the regeneration of mandible; 2) the intact existence of biofilm is also of great significance, which can block the influence of extraluminal soft tissue on regeneration; 3) when the wound was closed, the base of the soft tissue valve was supported by biological scaffold and biofilm, and sutured tightly to avoid infection in the operation area.

Conclusion

The application of odontogenic keratocyst extraction combined with GBR can shorten the time of osteogenesis, increase the amount of new bone formation, reduce complications, and improve the quality of life. It has a good application prospect in the treatment of odontogenic jaw cyst. It is worthy of clinical application. The disadvantages of this study are small sample size and short follow-up time. In the future, we need to further expand the sample size and continue to delay the return visit time. In addition, a reasonable control group can be set up for prospective comparative study.

Funding

This study was supported by the National Natural Science Foundation of China (grant no. 31800816) and Fundamental Research Program Funding of the Ninth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine (grant no. JYZZ109).

Conflict of Interest

The authors declared no conflict of interest.

Ethics approval and consent to participate

The protocols used in the present study were approved by the Ethics Committee of the Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine (Shanghai, China) and informed consent was provided by the patients. The ethics approval reference number is SH9H-2020-T391-1.

References

1. Santosh ABR, Boyd D, Laxminarayana KK (2020) Clinical Outline of Oral Diseases. Dent Clin North Am 64:1-10.
2. Santosh ABR (2020) Odontogenic Cysts. Dent Clin North Am 64(1):105-119.
3. Zhao Y, Liu B, Zhao YF (2019) Controversies Regarding the Management of Teeth Associated with Cystic Lesions of the Jaws. Chin J Dent Res 22:81-92.
4. Speight PM, Takata T (2018) New tumour entities in the 4th edition of the World Health Organization Classification of Head and Neck tumours: Odontogenic and maxillofacial bone tumours. Virchows Arch 472:331-339.
5. de Moraes ATL, Soares HA, Viana Pinheiro JJ (2020) Marsupialization before enucleation as a treatment strategy for a large calcifying odontogenic cyst: Case report. Int J Surg Case Rep 67: 239-244.
6. Shah N, Logani A, Kumar V (2014) A minimally invasive surgical approach for large cyst-like periapical lesions: A case series. Gen Dent 62:e1-5.
7. Chacko R, Kumar S, Paul A (2015) Spontaneous bone regeneration after enucleation of large jaw cysts: A digital radiographic analysis of 44 consecutive cases. J Clin Diagn Res 9: ZC84-9.
8. Rubio ED, Mombrú CM (2015) Spontaneous Bone Healing after Cysts Enucleation without Bone Grafting Materials: A Randomized Clinical Study. Craniomaxillofac Trauma Reconstr 8:14-22.
9. Mordini L, Hur Y, Ogata Y (2020) Volumetric Changes Following Lateral Guided Bone Regeneration. Int J Oral Maxillofac Implants 35: e77-e85.
10. Chiapasco M, Rossi A, Motta JJ (2000) Spontaneous bone regeneration after enucleation of large mandibular cysts: A radiographic computed analysis of 27 consecutive cases.J Oral Maxillofac Surg 58:942-948.
11. Li X (2018) The study of bone tissue repair after curettage of mandibular cyst by CBCT. Qingdao University
12. Kim YK, Yun PY, Lee HJ (2011) Ridge preservation of the molar extraction socket using collagen sponge and xenogeneic bone grafts. Implant Dentistry 20:267-272.
13. Tonetti MS, Cortellini P, Lang NP (2004) Clinical outcomes following treatment of human intrabony defects with GTR/bone replacement material or access flap alone. A multicenter randomized controlled clinical trial. Clin Periodontol 31:770-776.
14. Yin XN, Wang XM (2011) Application of Bio-Oss® in bone repair after jaw cyst operation. Clinical Education of General Practice 6:677-678.