Surgical Treatment of Large Mandibular Cysts

Klara Sokler[1]
Sebastijan Sandev[2]
Joško Grgurević[3]

[1]Clinical Department of Oral Surgery Clinical Hospital Dubrava
[2]School of Dental Medicine University of Zagreb
[3]Department of Oral Surgery University Dental Clinic Clinical Hospital Center Rebro, Zagreb

Summary

Based on a review of available literature sources on the treatment of large mandibular cysts, a comparison of various treatment approaches has been performed in order to identify similarities and differences between the treatment approaches used by domestic and foreign authors.

The review shows that basic principles of the treatment of large mandibular cysts are changing in Croatia as well as abroad. Marsupialisation methods are being gradually replaced by different methods which all primarily close the bone defect, as in the Partsch II method. Methods differ only in the approach used to close it. The common goal of all these methods is to reduce the postoperative bone defect in order to reduce the possibility of coagulation, infections and to heal the wounds primarily.

These methods lead to significantly reduced duration of the treatment of large mandibular cysts.

The choice of the most suitable method is left to the surgeon, who, based on his experience and results obtained with a particular method in the past, has to choose the method which will pose the least possible stress on the patient and ensure the shortest treatment time.

Key words: *odontogenic cysts, surgical treatment.*

Acta Stomat Croat
2001; 253-257

REVIEW
Received: April 20, 2001

Address for correspondence:

Klara Sokler DDS, MSc
Clinical Department of Oral Surgery
Clinical Hospital Dubrava
Avenija G. Šuška 6
10040 Zagreb
Croatia

Introduction

A cyst is a pathological cavity in the bone or soft tissue, with an outer wall of connective tissue and an inner wall composed of epithelium. The interior of the cystic cavity is filled with a cystic content, which may be watery, colloidal or semisolid (1).

Therapy for a cyst is determined by its aetiology and localisation, which on the one hand means that the causal tooth must be treated or removed, and on the other that the cystic lining, which secretes the cystic content, must be removed. Several methods of treatment exist depending on the size and localisation. Drainage of the cyst ensures that fluid no

longer accumulates, and its stimulus on the cystic capsule disappears, which is considered one of the potential causal agents of its progressive growth. Consequently its autonomic growth is arrested and accordingly further development (1).

Authors' opinions differ with regard to the classification of cysts into large and small. This is largely due to the fact that in the case of cysts of the jaw, up to a certain dimension, it can be anticipated that the cystic cavity in the bone will fill with a blood clot after desquamation of its capsule and become the basis and initiator of new bone formation. On the other hand, in larger cystic cavities organisation of a blood clot is not possible and hence the formation of new bone. A blood clot in a devitalised area is a great risk, as it can easily become infected and lead to the unwanted consequences of local inflammation. It can also lead to the formation of a large haematoma, which occurs as a result of uncontrolled accumulation of blood in the bone cavity and its penetration into the soft tissue.

A review of operative procedures

Cysts are most frequently treated surgically. The proposed methods of treatment by chemical means were not adequate, mainly because it is impossible to accurately determine and follow up the effect of the chemical on the cystic capsule and surrounding bone tissue. Possibilities of treatment and choice of surgical methods for operations of cysts of the jaw depend on the size, localisation and pathological formation (1).

The name Carla Partscha (1855-1932) is connected with a method for surgical treatment of large mandibular cysts which he introduced in 1910, and which is still today called Partsch I method. Later a method of treatment of small jaw cysts (smaller than 2.5 cm in diameter) was attributed to the same author (2).

The method of enucleation is used for small cysts, although it should be used whenever possible as it has certain advantages over marsupialization: a method used for surgical treatment of large cysts (2).

Enucleation completely removes the cystic capsule from the bone, therefore reducing the possibility of recurrence (4), which according to Pindborg (5) amounts to 33%, and according to Toller (6) 44%, and also the possibility of spreading carcinoma from the epithelium of the cystic capsule (3).

By the Partsch I method the large bone cavity in the mandible is drained into the oral cavity by the technique of marsupialization or other marsupialization modification. The principle of the method is to make an opening, i.e. fenestration, on the outer wall of the cyst through which the cystic content drains into the oral cavity. In this way pressure on the cyst is reduced, resulting in a reduction of the cystic cavity. After fenestration jodoform gauze is inserted into the cystic cavity in order to prevent infection and closure of the edges of the opening. The edges of the cystic capsule are previously sutured with the oral mucous membrane. The gauze is left for 1-2 days, after which an impression is taken of the bone cavity and an obturator fabricated from acrylic. The obturator must not cover the whole of the cavity as this interferes with cicatrization, i.e. reduction of the bone cavity. Its function is to maintain communication between the bone cavity and the vestibulum. The obturator is filed every 8 days and in this way becomes smaller. It remains in the mouth until the bone cavity has become so small that the obturator drops out of the cavity and the mucous membrane of the cyst is changed by metaplasia into oral mucous membrane (7).

Several months are necessary for complete regeneration of the bone, and in the case of large cysts several years (7).

Although marsupialization satisfies certain therapeutic requirements, it has significant drawbacks, such as slow healing and cicatrization. In addition, when cystic tissue is left in the bone there is a possibility of carcinoma developing from the cystic capsule. The method is not recommended for the maxilla, for which adequate, so-called rhinological, methods exist (7).

In order to improve the marsupialization method and to remove the drawbacks, a modified method was proposed, the so-called dual-phase method according to Hermann (1). This author developed a technique, the object of which was to speed up postoperative rehabilitation. The first phase consists of the standard Partsch I method and in the second

phase, which begins after 12-16 months, the remains of the cystic capsule are removed and the wound primarily closed (1). Another drawback of the method is the long period of treatment and the need to subject the patient to two operations.

For the treatment of large cysts methods for filling bone cavities with autogenous, allogenous or heterologous transplants followed, and finally the method of filling with alloplastic or synthetic implants (8,9).

Most frequently spongiosa bone or cartilage from the hip (crista illiaca), rib and shinbones (metafiza tibie) are used as autologous bone transplants (11), including bone transplants from the chin and part of the mandible (10,12,13). The risks involved with these methods are the rejection of the implants due to instability, poor blood supply, increased possibility of infection and the need to open a further operation field and resorption of the autotransplants (14,15).

Allogenous (homologous) bone is a human demineralised bone, the antigenicity of which is reduced to a minimum by a process of dry freezing (10). The most frequent complications connected with allogenous bone implants are the danger of immunological reaction by rejection of a foreign body, danger of resorption and deformation, and transfer of infection (HIV, hepatitis) (10).

Due to their biocompatibility and great porosity, which enables rapid vascularisation and adherence of osteoblasts, xenogenous (heterogenous) implants have osteoconductive ability, i.e. cicatrization of the recipient bone occurs in xenogenous implants (8, 10,16). A disadvantage of xenogenous implants is the possibility of their rejection due to infection. Collagenous fibres, hydroxyapatite and tricalcium phosphate are synthetic implants, which are also used for filling bone defects in the jaw. However their application in the treatment of large mandibular cysts has not been reported.

The clinical characteristic of odontogenic keratocysts is the frequency of recurrence, which occurs within the five-year postoperative period. In order to avoid this various authors have attempted to solve the problem by different methods of treatment.

In 1957 Brosch published a method for treatment of large cysts of the jaw in the area of the ascending ramus of the mandible by removing the lingual corticalis of the jaw above the cystic cavity, and complete desquamation. With regard to possible operative complications by Brosch's method of treatment, damage to the lower alveolar nerve and occasional fractures of the muscular process have been reported, while complete regeneration of tissue occurs at least eight months to two years after the operation (17,18). However, the wound in the mouth primarily closes, and there is no problem with regard to the collection of food or wearing the obturator, which occurs with the technique of marsupialization.

Farmand describes the advantages of Brosch's method compared to cystectomy and marsupialization, and reported faster cicatrization, in spite of the fact that the bone defect is larger. The reason for this is the reduced bone cavity and better adherence of the soft tissue with the exposed bone. After adaptation of the soft tissue no facial deformations occur on the exposed bone (17).

Bramley, 1974, proposed a radical method with resection of part of the jaw and reconstruction with bone transplants (19).

Authors such as Voorsmith (20,10) and Williams (22) recommend the use of Carnoy's liquid prior to enucleation of a cyst.

In 1994 Williams described a method which included enucleation of the cyst and curettage. Prior to curettage the remains of the cystic sheath are marked with methylene blue and Carnoy's liquid is used. In the case that the cyst is close to the alveolar nerve it is isolated by sterile petrolate. The method includes excision of the mucous membrane at the point where the cyst perforates the bone. The use of chemicals or mechanical curettage is based on the presumption that the recurrences are a consequence of the remains of cystic epithelium in the bone cavity (22).

Voorsmit reported that Carnoy's liquid penetrated 1.54 mm deep into the bone without damage to the alveolar nerve (19,20), although Dammer in 1997 used this method in his investigation and described parasthenia of the lower alveolar nerve and also damage to the surrounding bones (23). Dammer and coworkers concluded that in the case of small keratocysts, up to 1 cm in diameter, curet-

tage is satisfactory, while radical resection is necessary for large cysts (23).

In 1984 Webb and Brochbank described a combined method of enucleation and criotherapy (26). They achieved good results during a five-year period with regard to recurrence. In 1988 Jensen, Sindet-Pederson and Simonsen published a study in which the method of enucleation of keratocysts was compared with the above method of enucleation combined with criotherapy (27). Their study showed that recurrences of keratocysts treated by enucleation occur in 33% of cases, while recurrences treated by a combination of enucleation and criotherapy occur in 38%. The results indicate that there are no essential differences between treatment of large keratocysts by enucleation alone or by a combination of enucleation and criotherapy (27).

After enucleation of the cystic capsule criotherapy is performed by freezing the walls of the bone cavity by spraying with liquid nitric oxide at a temperature of -70° on two occasions for a period of one minute each (27). Occasional postoperative complications were parasthenia of the lower alveolar nerve and intraorbital nerve. Complete recovery of the parasthenia occurred after two years (26).

Various methods for the treatment of keratocysts by criotherapy have been proposed (Bradley and Fisher, 1975). Jensen considers that is it difficult to determine the depth of the effect of low temperatures in tissue by criotherapy, and thus its effectiveness. He also considers that criotherapy causes more postoperative complications (27).

In 1996 Marker described treatment of odontogenic keratocysts by a technique of decompression in the first phase and cystectomy in the second. The first phase consists of decompression by means of small polyethylene tubes, which are used for drainage of the cystic fluid. The small polyethylene tubes used are of different lengths, which are determined according to each particular case. The method of decompression achieves a reduction in the cystic volume, thinning of the cyst walls and regeneration of bone. The second phase consists of cystectomy, which begins when reduction in the cyst volume of 50%-60% has been achieved. This takes place approximately 9 to 12 months after decompression and cyst reduction is followed up every 4 months by an orthopantomogram (28).

The results of treatment of odontogenic keratocysts by decompression and later cystectomy show less damage to anatomic structures of the mandibula compared to other methods, such as primary radical cystectomy or other methods of resection, and a reduced number of recurrences, particularly in cases where the phase of decompression lasts for a longer period (28).

In this country in 1988 Grgurević and Knežević published and described a method for treating large mandibular cysts by permanent postoperative suction (29). The theoretical basis of this method is that a blood clot is used after cystectomy to fill the bone cavity and for the formation of new bone. Cicatrization over the blood clot enables retention of the normal anatomic form of the alveolar ridge and jaw, and enables the fastest cure. However, a drawback to the formation of a blood clot is the possibility of infection and dehiscence, because of uncontrolled bleeding in the bone cavity and the formation of a large haematoma. The risk of the above complications increases with the size of the cyst (29).

A characteristic of this method is that the cystic capsule is completely desquamated, and the bone cavity is drained by permanent suction. By means of suction, negative pressure is created in the bone cavity within a period of 5-7 postoperative days, and pulling of the soft tissue towards the bone base decreases its volume, and the wound heals primarily, as in the case of small bone cavities. Usually 2-6 months are necessary for complete regeneration of the bone tissue. Apart from the fact that the method of treatment by permanent postoperative suction is a simple method for treating large bone cavities of the mandible, it is also relatively painless for the patient, and the period of rehabilitation is considerable shortened and amounts to 8-14 days (29) (Figs. 1,2,3,4,5 & 6). So far results have been good, although a very small percentage of the above complications have occurred (absence of cicatrization at the site of the suture dehiscence, infection of the content due to premature removal of suction) (28).

As all complications can be treated during the first postoperative month, their treatment is much shorter, particularly when all the disadvantages of marsupalization are taken into account (29).

Discussion

A review of available literature shows that over the last 90 years a large number of different methods for the treatment of large mandibular cysts has been described, and that new possibilities are continually being discovered and investigated. The basic problems which it was hoped surgical methods would solve were postoperative recurrences, particularly in the case of developed odontogenic cysts, today known as odontogenic keratocysts or primordial cysts, and also the problem of the healing of large bone cavities, which are most frequently compromised by infection of the blood clot.

With regard to recurrences of odontogenic keratocysts it would be appear that two facts exist which need to be taken into account during the surgical procedure. The first is the potency of the epithelium of odontogenic keratocysts, i.e. its effect on surrounding bone, and the second is that their capsules are exceptionally thin, and that during the process of desquamation there is a possibility of them tearing and part of the capsule remaining on the bone wall, which may later cause a recurrence. The application of chemical substances or low temperatures, with the object of destroying any remains of the capsule, has no medical grounds, as it is impossible to precisely determine the depth of their effect and there is a risk of complication. The procedure consists of careful desquamation of the cystic capsule, rinsing the bone defect with 3% hydrogen peroxide, in order to detect and remove eventual remains of the capsule, and regular check-ups after the operative procedure until complete healing of the bone defect has occurred.

With regard to the healing of large bone defects after enucleation of jaw cysts, the method used is unimportant, although the method of marupialization is certainly no longer the method of choice. Namely, marsupialization is only applied in exceptional cases in patients with poor health, so as not to expose such patients to the risk of an operation with general anaesthetic. All methods which primarily close the bone cavity and at the same time endeavour to reduce the devitalised space and prevent infection of the blood clot, are good. The method applied depends on the personal experience and preference of the surgeon. The opinions of authors in this country do not differ essentially from those of world authors.

Conclusion

Ideal therapy for large odontogenic cysts does not exist. In spite of the fact that numerous methods and techniques have been proposed the perfect therapy has still not been determined. Clearly, each surgical technique has several advantages and also several disadvantages. The application of a particular surgical technique depends on the cyst, its characteristics, localisation, size, aetiology, etc. However, the technique chosen also depends to a great extent on the surgeon, as even the best technique will not be satisfactory if incorrectly carried out.