

# Outcome of Bone Recycling using Liquid Nitrogen in Biological Reconstruction Procedure in Aggressive Odontogenic Keratocystic Lesion of Mandible: A Case Report

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## 1. Introduction

Odontogenic keratocysts (OKC) are benign intraosseous lesions of odontogenic origin characterised by an aggressive behaviour with a recurrence rate of 2.5 to 62.5 %. It is the third most commonly occurring odontogenic cyst comprising of approximately 20% of all odontogenic cysts. Clinically, OKC may occur in **the maxilla or mandible**, but it has a distinct tendency to involve the posterior body and ascending ramus of the mandible<sup>1</sup>. It has a slight gender predilection of males to females at a ratio of 1.1–2: 1<sup>7</sup>. Radiographically, majority (approximately 70–80%) of OKC present as a unilocular radiolucency with a well corticated borders. But may also present as a multilocular radiolucency as well. They may be associated with an impacted or unerupted tooth which may mimic the radiographic appearance of a dentigerous cyst.

Surgical management can be classified into radical and conservative approaches. The radical approach utilises resection to manage OKC whereby the pathology is removed intact with a margin of uninvolved bone. The en bloc removal of the pathology with a margin has resulted in extremely low recurrence rates (0% - 8.4%) but also greater patient morbidity. Enucleation and chemical cauterization is the standard of care for OKC, which results in bone defects over the cystic lesion in the jaw<sup>1</sup>. Several orthopaedic literatures have supported the use of cryopreserved bone recycling in case of malignant long bone tumours. This case report focuses on bone recycling and assessment of bone density, bone regeneration capacity following placement of cryopreserved bone obtained and packed within cystic defects.

## 2. Case Report

A 22 year old male patient reported with retained deciduous teeth, pain and swelling in relation to 34 - 36 tooth region for the past 2 months. On aspiration, creamy white fluid obtained. X ray orthopantomogram revealed well defined solitary, radiolucent, unilocular, expansile lesion with smooth, corticated borders extending upto left mandibular first molar to an impacted left mandibular canine. Based upon the radiographical and aspiration cytology findings it has been provisionally diagnosed as odontogenic keratocystic lesion of mandible. An incisional

biopsy was performed and finally diagnosed with OKC. The lesion was managed conservatively by enucleation and chemical cauterization using modified Carnoy's solution. The bone overlying the cystic lesion thinned out due to cystic expansion, was removed and cryopreserved using the free freezing method in liquid nitrogen. Excised bone tissue immersed in liquid nitrogen stored in dewar flask for 20 minutes followed by room temperature for 15 minutes and thawed in warm distilled water at about 30°C for another 15 min<sup>5</sup>. The cryopreserved bone was packed into the cystic defect area following enucleation and chemical cauterization and followed up for a period of 6 months. At the end of the 6 month period, there was no evidence of paraesthesia, wound dehiscence, signs of pathological fracture, tooth mobility and recurrence<sup>8</sup>. Bone density and bone regeneration capacity of cryopreserved bone in the cystic defect area was assessed using cone beam computed tomography of mandible which resulted in a remarkable increase in residual bone height and density.

## 3. Discussion

Cryopreservation is one of the unique and advantageous ways of bone recycling and biological reconstruction of defect areas intraoperative period. Usually the bone defects following cystic enucleation may recover spontaneously or with assisted healing with the use of bone graft or other bone substitute materials in secondary bone regeneration procedures, thereby increasing the residual bone height and in the future a better ability to place endosseous dental implants<sup>3</sup>. There are two methods of freezing - Free freezing and pedicle freezing. In the free freezing method, it includes complete removal of affected bone from the patient's body, immersion into liquid nitrogen, and returning into patient's body<sup>4</sup>. Frozen autografts contain autogenous proteins, growth factors, and cytokines and do not elicit an immune reaction<sup>6</sup>. Characteristics of liquid nitrogen treated bone include strength, superior osteo - conductive and osteo - inductive capacity due to spared matrix proteins and enzymes<sup>5</sup>. They have the advantages of early bony union and low risk of bone resorption in spite of some complications similar to allografts, such as infection, fracture, nonunion or graft failure<sup>5</sup>. Reported complications include excepting local recurrence, but not severe wound dehiscence (5.5%), paraesthesia (5.5%), infection (5.5%), and pathologic fracture (11.1 %) <sup>9</sup>. Several orthopaedic literatures supported

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this cryopreservation method even for malignant long bone tumours.

#### 4. Conclusion

Recycled bone technology can be considered as an alternative to secondary bone regeneration procedure and an excellent option compared to resection, hence providing good functional outcome without recurrence. The concept of recycling is widely used in the field of orthopaedics which provides us a good alternative approach in reconstruction in oral and maxillofacial surgery.

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Figure 1



Figure 2



Figure 3