



## Non-Invasive Implant Placement Subsequent to a Large Glandular Odontogenic Cyst

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### INTRODUCTION

Cysts of the jawbones fall into two main categories depending upon their origin; odontogenic cysts and non-odontogenic cysts. Odontogenic cysts develop from the cells that form teeth and have a distinct membrane which is derived from the rests of the odontogenic epithelium. Non-odontogenic cysts arise from epithelial remnants of embryonic ducts left behind after facial and jaw development.<sup>1</sup> Examples of odontogenic cysts include the dentigerous cyst, the radicular cyst, the residual cyst, the lateral periodontal cyst and the odontogenic keratocyst. Examples of non-odontogenic cysts include the nasopalatine duct cyst, nasolabial duct cyst, the median palatal cyst and the epidermoid cyst.

### THE GLANDULAR ODONTOGENIC CYST

The glandular odontogenic cyst is a unique lesion. It was reported and described by Gardner et al in 1988<sup>2</sup> as a distinct entity due to its unique histopathological features and its behavior. Prior to Gardner's distinction, these cysts were melded into both odontogenic and non-odontogenic categories. Gardner distinguished the histopathological appearance of this cyst from that of other jaw cysts by the following characteristic features:

1. There is no inflammatory infiltrate present within the connective tissue that underlies the stratified squamous epithelium lining of the cyst.
2. The superficial layer of the epithelium consists of eosinophilic cuboidal cells that make the surface irregular and sometimes papillary.
3. Within the epithelium, there are pools of mucicarmine-positive material, often weak and lined by eosinophilic cuboidal cells similar to those found on the surface of the epithelium.
4. Mucous cells are prominent in some, but not all examples. They are usually found on the surface and when they are present they replace the eosinophilic cuboidal cells.
5. The basal cells are sometimes hyperchromatic and may be vacuolated.
6. The epithelial cells in focal areas may be arranged into spherical structures
7. Irregularly shaped calcifications may be present in the connective tissue beneath the epithelium

To avoid confusion, and reinforcing Gardner's distinction, the World Health Organization recognized the glandular odontogenic cyst as its own pathological entity and has classified it as an odontogenic cyst. Although the histopathological appearance is distinct, it remains challenging for the oral pathologist because the mucus-producing cells found in the samples resemble those of the mucoepidermoid carcinoma, which requires an entirely different approach to treatment.<sup>3,4</sup>

## CHARACTERISTICS & BEHAVIOUR

The glandular odontogenic cyst is certainly rare. Only fifty cases have been reported in the literature up until January 2016.<sup>5</sup> Overall incidence has been estimated as 0.012% of all cysts. It occurs over a wide age-range but more commonly in the 4th and 5th decades of life. It occurs in either the maxilla or the mandible. It can be unilocular or multilocular. In 95% of cases, the borders of the glandular odontogenic cyst are well defined radiographically.<sup>6</sup> The concerning characteristics of the glandular odontogenic cyst are its aggressiveness and its high recurrence rate. By aggressive, the literature means these cysts can reach very large sizes and have a greater tendency to expand or even perforate the cortical plate.<sup>6</sup> Sizes can range from 0.5cm - 12cm with an average size of 5cm, with most being larger than 2cm. Root resorption and tooth displacement occur in approximately 23% of cases.<sup>6</sup> The recurrence rate ranges from 25-55%.<sup>10</sup>

## TREATMENT

Small unilocular lesions can be treated by enucleation. Enucleation is the process of removing the lesion in one piece without rupture, and without involving adjacent tissue.

In large or multilocular lesions treatment by enucleation alone is associated with a high recurrence rate.<sup>3,8</sup> For these lesions, an initial biopsy is recommended. Then, marsupialization followed by second phase surgery is recommended. Marsupialization is the surgical technique of cutting a slit into the cyst and suturing the edges of the slit to form a continuous surface from the exterior to the interior surface of the cyst. By suturing in this fashion, the site remains open and can drain freely. This technique is used to treat a cyst when a simple incision and drainage would not be effective and where complete removal of the surrounding structure would not be desirable, for example, if close to vital anatomical structures.

Other options for large lesions are enucleation with peripheral ostectomy for unilocular cases and marginal resection or partial jaw resection for multilocular cases.<sup>6,7,9</sup>

With all Glandular Odontogenic Cysts, follow-up should continue for at least three years and up to seven years in cases with features associated with increased risk.

## CASE REPORT

### FINDINGS

A 51 year old caucasian American male presented for a routine dental checkup. Medical history revealed a nonsmoker with high blood pressure and frequent alcohol intake. Incidental finding on a panoramic image revealed a large radiolucency of the left posterior mandible (**Figure 1 and 2**). The lesion was asymptomatic, as most cysts of the jaw bones are unless they become secondarily infected. There was no paresthesia or dysesthesia.



Figure 1: Panoramic image of large radiolucency of the left posterior mandible.

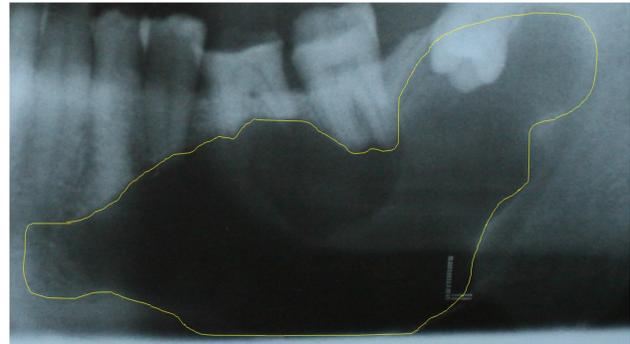


Figure 2: Outlined close-up of radiolucency.

The original clinical impression was an odontogenic keratocyst or ameloblastoma. A specimen of tissue measuring approximately 1.0cm x 1.0cm x 0.2cm was submitted. From this initial biopsy, odontogenic keratocyst and ameloblastoma was ruled out. One month later the patient underwent marsupialization of the cyst with another biopsy. Three specimens, approximately 2.4cm x 0.9cm x 0.1cm, 1.5cm x 0.3cm x 0.1cm and 1.8cm x 1.7cm x 0.2cm respectively were taken and submitted.

The oral pathologist reported a diagnosis of a glandular odontogenic cyst with the following comments about the cyst lining, “Microscopic examination reveals a cystic lesion lined by squamoid epithelium rimmed by mucous cells and, in some areas, exhibiting papillary epithelial projections. These projections are also lined by mucous cells. The cyst wall consists of fibrovascular tissue with marked acute and chronic inflammatory infiltrate”. Comments on the contents of the cyst cavity were, “Granulation tissue with fibrinous material and cholesterol clefts lined by multinucleated foreign body giant cells”.

#### CYST REMOVAL

Subsequent to marsupialization, the cyst shrunk down. Approximately one year later, the patient was brought to the operating room for cyst removal under general anesthesia. The area was anesthetized with an inferior alveolar block and infiltrations along the border of the mandible. Incisions and a full thickness flap from tooth #17 thru 22 was elevated. The tunnel for marsupialization was truncated and surgical removal of tooth #18,19,20,21 was performed. A surgical Hall drill was used to remove buccal bone from tooth #17 which was subsequently removed. The cyst cavity was cleaned using curettes and saline irrigation. All bony prominences and remaining interseptal bone was removed. Closure was achieved with multiple 3.0 vicryl sutures (Ethicon). The inferior alveolar nerve was not visualized.

The patient was seen post-operatively at one week, one month and three month intervals. Healing was routine and uncomplicated. After three months, a comprehensive oral evaluation was performed and dental records were taken. **(Figure 3)**.

Findings included: missing teeth #7,17,18,19,20 and 21. Teeth #16 and 32 were impacted. Head, neck and intraoral palpation was within normal limits. Intraoral visual findings were within normal limits except for soft tissue inflammation adjacent to pontic #7. Oral cancer

screening was negative with no family history of cancer of the mouth or throat. Several areas of tooth decay and defective dental restorations were noted. The periodontal status was consistent with early periodontitis as sulcus depths measured 1-5mm and tooth #9 and 10 presented with Class I and II mobility respectively. The airway was Mallampati Class 3. The cuspid and remaining molar occlusion was a Class I with a 7mm overbite and a 5mm overjet. The mandibular midline shift was 1mm to the left. Range of motion of the mandible was within normal limits with maximum opening of 58mm with no deviation or deflection, protrusive at 8mm, left lateral at 10mm, and right lateral at 15mm. Stethoscope evaluation revealed no audible joint noises.

A CT scan of the mandible revealed no evidence of cyst recurrence. There was adequate available bone for implants in sites #18,19, 20 and 21 to support restorations to replace the missing teeth.

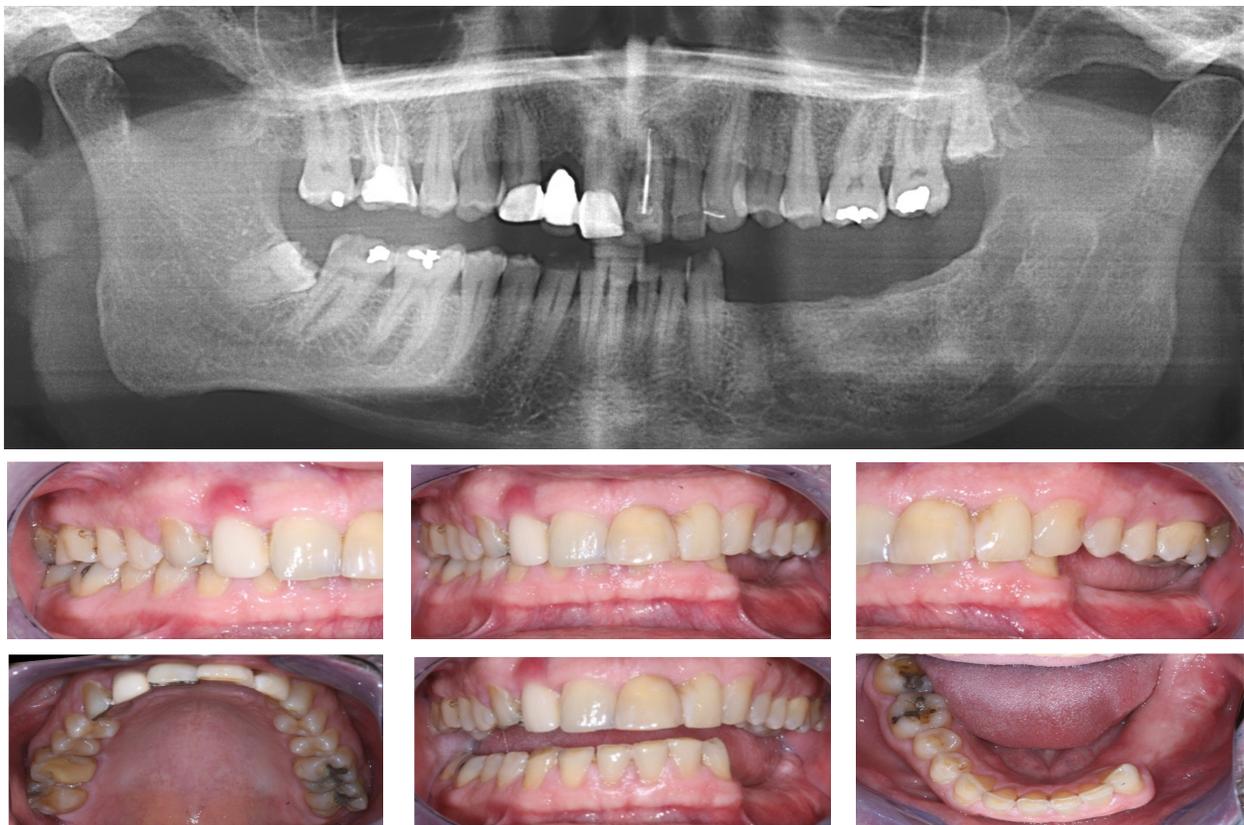


Figure 3: Three months after cyst removal, complete dental records were taken.

### TREATMENT PLAN

Comprehensive treatment of the entire masticatory was recommended, but patient expressed financial obstacles. After being educated and informed on the advantages and disadvantages of limited treatment versus comprehensive treatment, he exercised his patient bill of rights and refused comprehensive treatment. He chose treatment limited to the mandibular left sextant.

Prosthetic options to replace teeth #18,19,20 and 21 included a removable partial denture and implant supported crowns. The patient eliminated the removable prosthetic option and elected a fixed prosthesis. A 4-unit fixed prosthesis supported by four implants in sites #18,19,20 and 21 was recommended. **(Figure 4)**. However, due to financial restrictions, the fixed prosthesis was modified to a 3-unit FPD #19-21, supported by two implants in sites #19 and 21 respectively. Computer guided surgery was planned using Simplant software (Simplant). **(Figure 5a,b)**

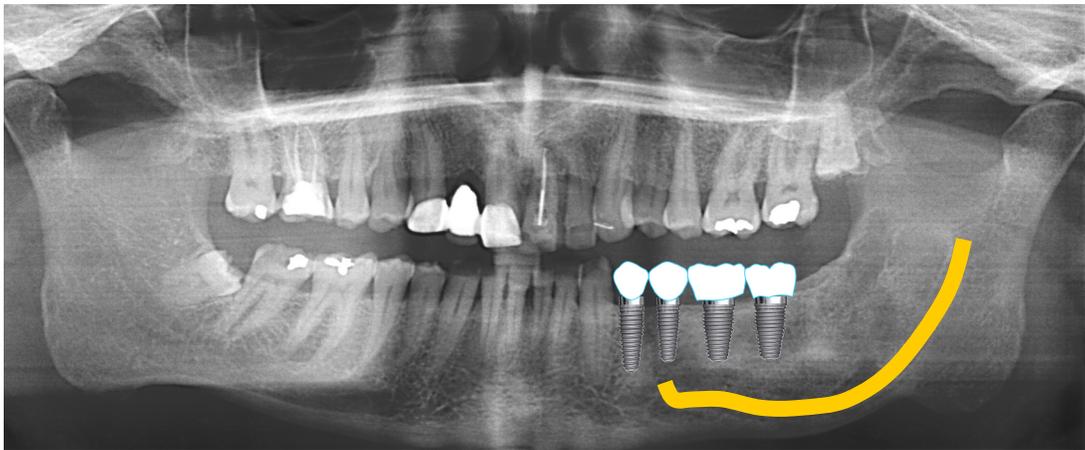


Figure 4: Graphic of recommended treatment.

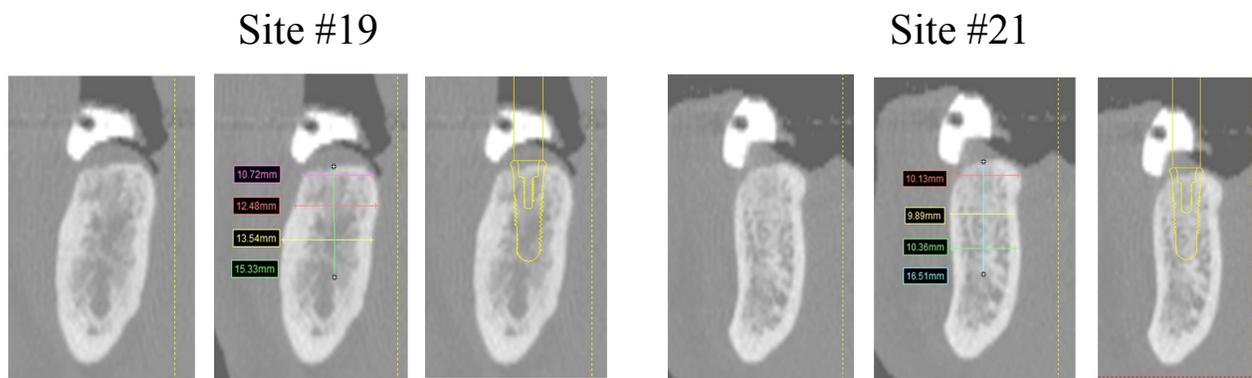


Figure 5a: Implant planning in site #19

Figure 5b: Implant planning in site #21

#### IMPLANT PLACEMENT & RESTORATION

Approximately 1 year from removal of the glandular odontogenic cyst, the area was ready for implant placement. 20% benzocaine gel (Sultan) was applied topically to the buccal and lingual of the lower left sextant. Three carpules of mepivacaine hcl (Cook Waite) were administered via buccal and lingual infiltrations from edentulous site of #18 to #21. Profound anesthesia was obtained.

Osteotomy sites were marked on the soft tissue **(Figure 6)** with pointed pilot drills (Salvin Dental) utilizing a CAD/CAM surgical guide (Materialize). Rigid seating of the surgical guide was

enabled by both tooth and soft tissue support throughout three quarters of the dental arch. Fixation pins to secure the guides were not used so that the guides could be easily and intermittently removed to verify the accurate transfer of the computer plan to the oral cavity. Once the implant sites were plotted on the soft tissue, spade drills (Zimmer Dental) rotating at 1200rpm with copious internal and external irrigation were utilized to prepare the osteotomies. (Figure 7).

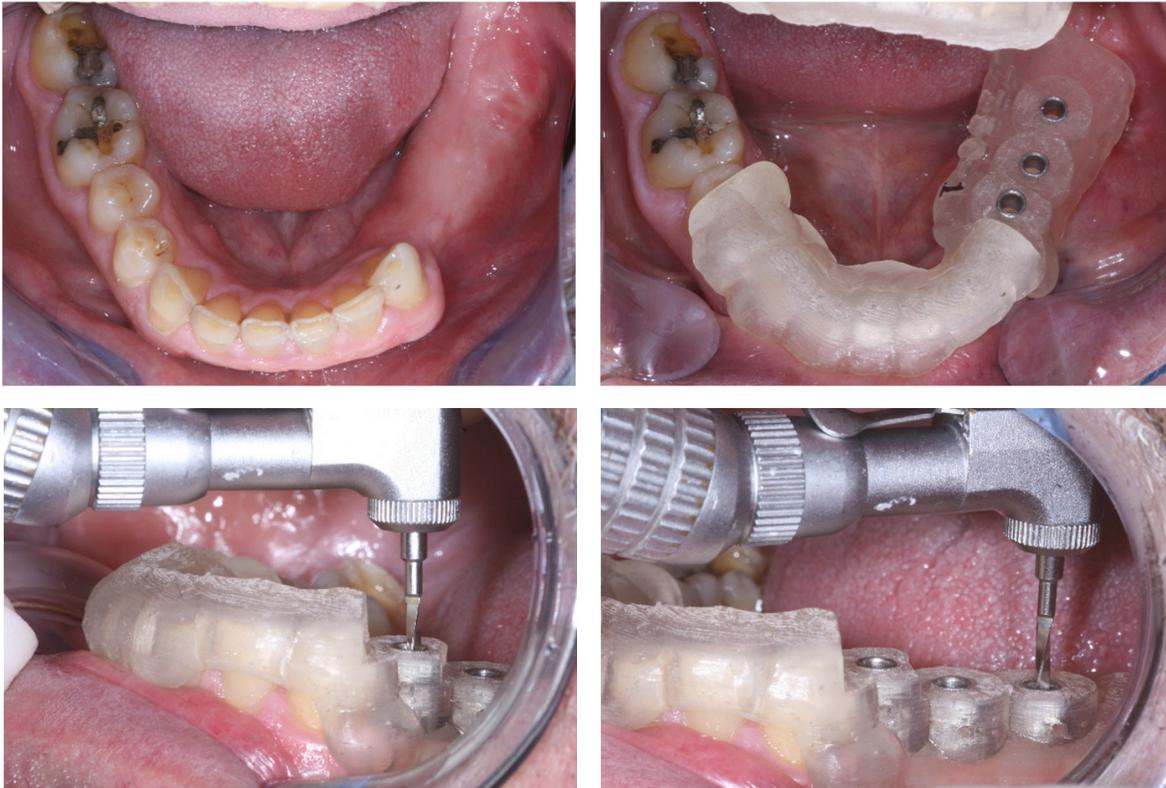


Figure 6: Implant sites being marked on the soft tissue with pointed pilot drills utilizing a CAD/CAM surgical guide.

Care was taken to avoid thermal injury of the bone, as insufficient irrigation can cause peri-implant bone loss.<sup>11</sup> Site # 19 was prepared sequentially in a step back fashion as described by Watzek<sup>12</sup> with first a 2.0mm spade drill to 11.5mm, followed by a 3.2mm spade drill to 8mm and completed at the coronal portion to 4.4mm. This osteotomy received a 4.7 x 11.5mm ScrewPlus fixture with a 5.7mm platform (Implant Direct). Site #21 was prepared similarly with a 2.0mm spade drill to 11.5mm, followed by a 3.2mm spade drill to 8mm and received a 3.75 x 11.5mm ScrewPlus fixture with a 4.7mm platform (Implant Direct). Transmucosal healing collars were placed to complete the one-stage implant placement protocol. (Figure 8)

Approximately three months after implant placement, osseointegration was confirmed (Figure 9) Fixture level impressions were taken. Custom titanium abutments were milled and inserted to 30cm. They received a cement-retained, 3-unit PFM prosthesis. (Figure 10). Three year radiographs revealed no evidence of recurrence of the glandular odontogenic cyst. (Figure 11)

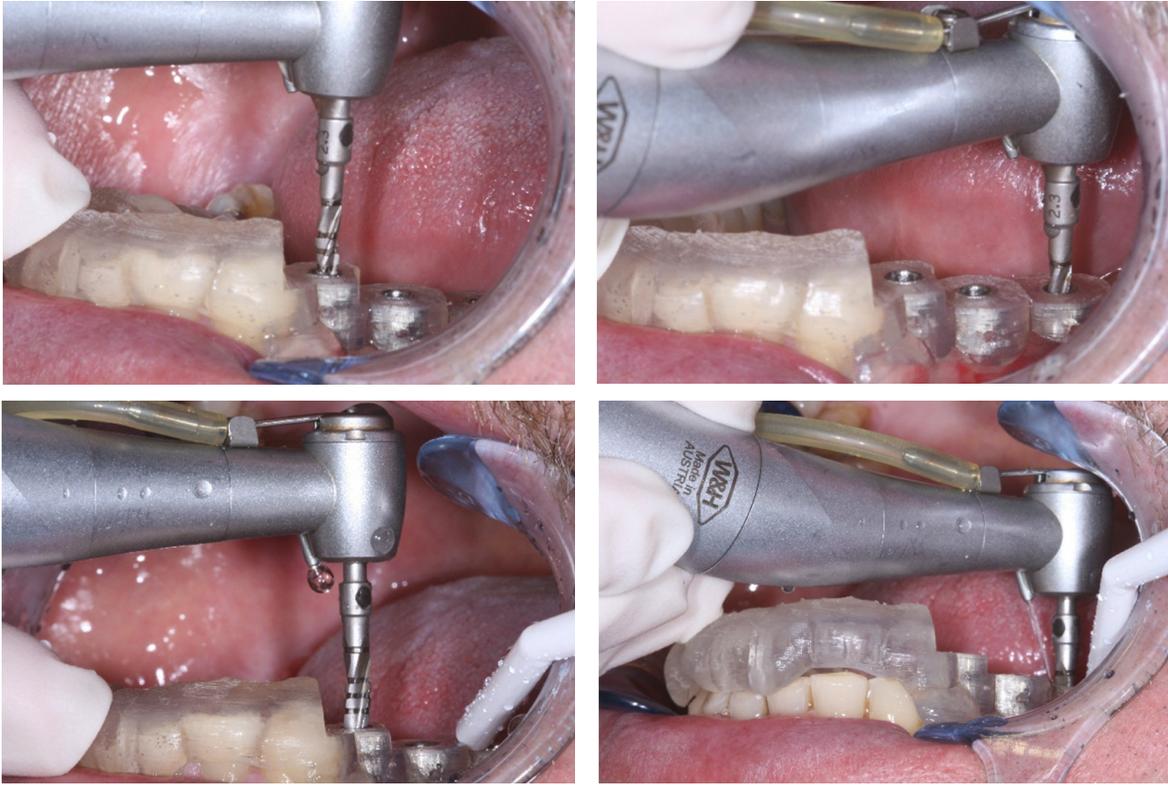


Figure 7: Spade drills rotating at 1200rpm with copious internal and external irrigation were utilized to prepare the osteotomies

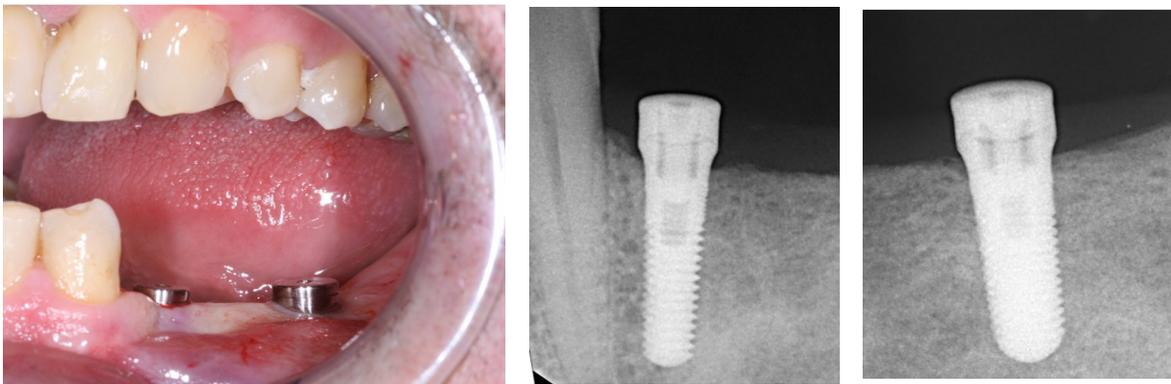


Figure 8: Transmucosal healing collars were placed to complete the one-stage implant placement protocol.

## DISCUSSION & CLOSING

With an overall incident rate of 0.012% of all cysts and a distinct histology, the glandular odontogenic cyst is a unique and rare lesion. This case study reports removal of a very large lesion, along with several teeth, followed by successful rehabilitation with dental implants in a non-invasive manner. This case has been followed for 5 years without recurrence.

The implant placement was considered non-invasive for several reasons; a mandibular block was not necessary, an incision with traditional full thickness flap reflection was avoided, sutures were not necessary, and the placement of the transmucosal healing collars at the time of implant placement eliminated the need for a second stage cutting procedure. Furthermore, computer planning in conjunction with computer guided surgery reduced the operating time as well as the trauma. The next day the patient was able to return to work and reported “just a little sore, not bad at all”. One week later, the patient presented for a routine post-operative visit. Healing was uneventful and patient was asymptomatic.

Coronal bone loss around dental implants is well documented in the dental literature. Some clinicians accept bone loss of approximately 1mm the first year followed by 0.1mm per year thereafter as non-pathological, while others strive for no bone loss at all. After following this

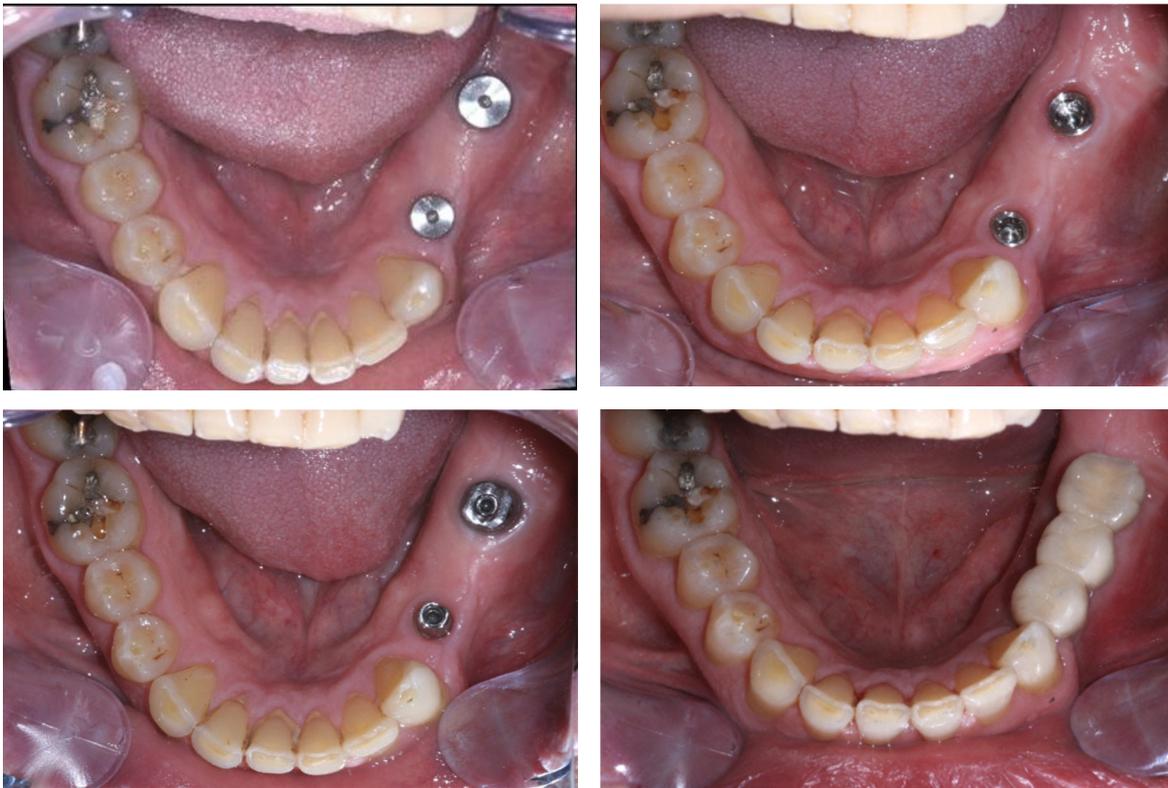


Figure 10: Approximately five months after implant placement, custom titanium abutments were inserted to 30mm and received a cement-retained, 3-unit PFM prosthesis.

case for 5 years, there has been little to no coronal bone loss. This can be attributed to the design and placement of the implant fixture. This particular fixture has a 2mm machined collar that separates the platform from the textured surface. The implant was placed with the junction of the textured and polished surface just at the crest of bone, keeping the microgap of the implant-abutment connection 2mm supracrestal, hence allowing space for the biological width (sulcus depth, the junctional epithelium and the connective tissue contact), and ultimately minimizing crestal bone loss.<sup>13</sup>

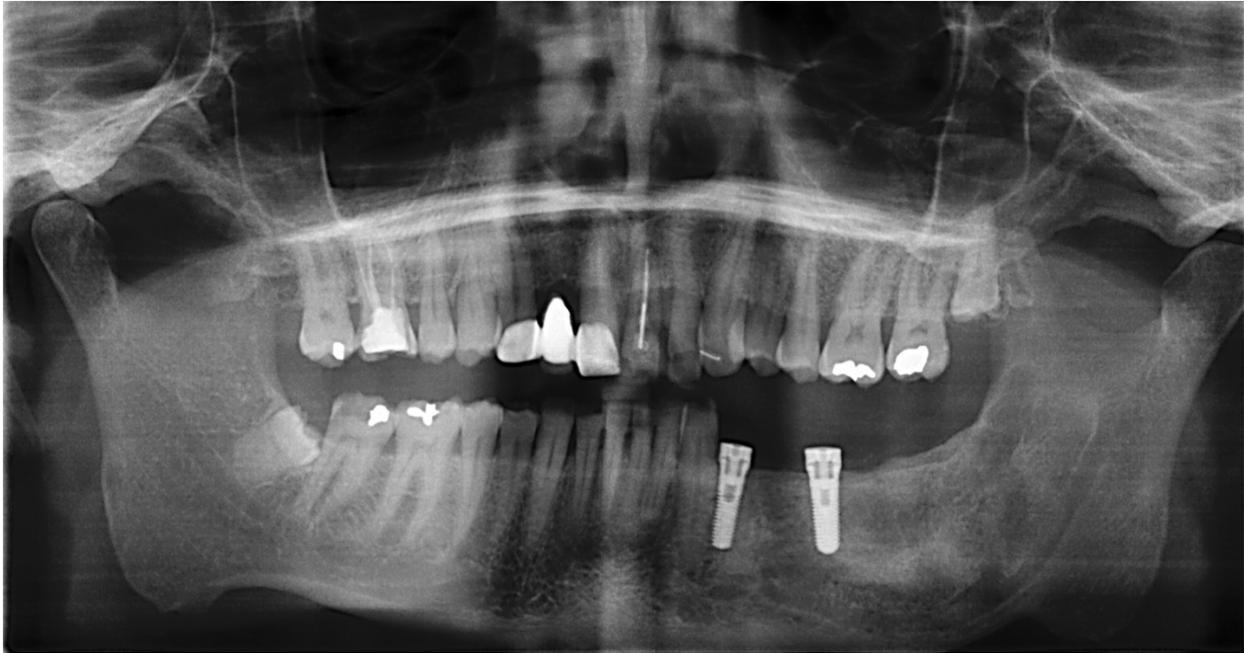


Figure 9: Approximately three months after implant placement, osseointegration was confirmed

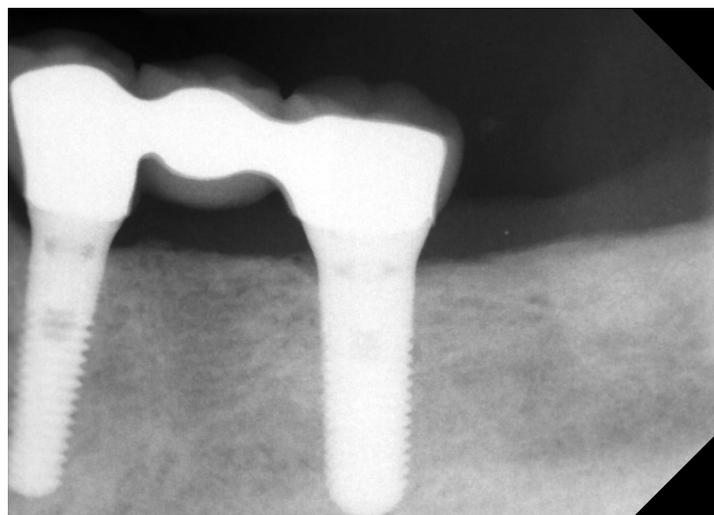


Figure 11: 3 year follow up

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