

Reconstruction of Post – Enucleation Cystic Jaw Defects Using Autogenous Tibial Bone Grafts: A Case Series

Avni Singh – Resident, Department of Oral and Maxillofacial Surgery, MGDCH, MGUMST, Jaipur, Rajasthan, India

Vikas Kunwar Singh – Professor & Head, Department of Oral and Maxillofacial Surgery, MGDCH, MGUMST, Jaipur, Rajasthan, India

Ruchika Tiwari – Professor, Department of Oral and Maxillofacial Surgery, MGDCH, MGUMST, Jaipur, Rajasthan, India

Sanjeevani Choudhary - Resident, Department of Oral and Maxillofacial Surgery, MGDCH, MGUMST, Jaipur, Rajasthan, India

Abstract:

Background :

Radicular cysts are the most common inflammatory odontogenic cysts of the jaws, arising secondary to pulpal necrosis and chronic periapical infection of non-vital teeth. Surgical enucleation is often required for large lesions to completely remove the cystic lining and prevent recurrence. In extensive defects, autogenous bone grafting remains the gold standard for reconstruction, providing osteogenic cells and structural support. The tibia serves as a convenient extraoral donor site, offering adequate cortico-cancellous bone with relatively low morbidity.

Purpose: To highlight a clinical approach for cyst enucleation followed by reconstruction utilizing an autogenous bone graft for optimal functional and aesthetic outcomes.

Case Series : In this case series, we present 5 cases, including 3 male and 2 female patient with chief complaint of pain, swelling upper tooth region & with complaint of food lodgement & nasal regurgitation since birth who underwent cystic enucleation followed by reconstruction with tibial autogenous bone graft, highlighting the surgical technique, postoperative outcomes, and considerations for donor-site selection.

Conclusion: Results of this case series suggest that the use of tibial autogenous bone grafts harvested via the medial approach is a safe, simple, and effective method for grafting, providing a high volume of cancellous bone with low morbidity.

Keywords: autogenous bone graft, tibial bone graft, radicular cyst, bone grafting, secondary alveolar bone grafting, cystic enucleation

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I. INTRODUCTION :

Radicular cysts also known as periapical cyst, radicular cysts are the most common odontogenic cysts of the jaws, comprising approximately 60–70% of all jaw cysts. They develop from epithelial remnants of Malassez, which are activated by chronic inflammatory stimuli associated with pulpal necrosis of non-vital teeth, and are predominantly located in the maxillary anterior region. These lesions typically manifest as well-defined, round or oval radiolucency at tooth apex on radiographs, often asymptomatic unless secondarily infected, leading to swelling, pain, or cortical expansion in larger cases. While small cysts may resolve with nonsurgical endodontic therapy alone, extensive lesions exceeding 1 cm frequently necessitate surgical intervention.¹

Cyst enucleation involves raising a mucoperiosteal flap, exposing the lesion, careful removal of the cystic sac without rupture, and thorough curettage of the cavity walls. For large defects post-enucleation, reconstruction is essential to restore contour, function, and prevent complications like pathologic fractures or soft tissue collapse.² Intraoral donor sites include the mandibular ramus, symphysis, coronoid process, and maxillary tuberosity, while extraoral sites

include the proximal tibia, iliac crest, and calvarium; graft volume is determined by defect size and shape.³

Secondary alveolar bone grafting (SABG) reconstructs the alveolar cleft in patients with cleft lip or palate, typically during mixed dentition to stabilize the maxillary arch and support tooth eruption. This procedure uses autologous bone, such as the iliac crest, tibial bone graft to close the oronasal fistula and enable orthodontic treatment or implants. Success rates generally exceed 80-90% with proper timing and technique. SABG addresses alveolar clefts affecting 75% of cleft lip/palate cases, aiming to separate nasal and oral cavities while providing bone for canine or lateral incisor eruption.

Autogenous tibial bone grafts are particularly advantageous for mandibular reconstruction after radicular cyst enucleation, providing a mix of cortical and cancellous bone harvested via a small anteromedial incision, yielding 10-20 cc of graft material with minimal donor-site morbidity. Tibial grafts exhibit rapid revascularization, high cell viability, and structural stability, making them suitable for load-bearing defects. Tibial bone grafting following cystic enucleation represents an effective treatment strategy for patients with non infected lesions of the jaws. ⁴

II. CASE SERIES :

Total 5 patients who had undergone cystic enucleation followed by reconstruction with tibial bone graft as well as secondary alveolar bone grafting in department of Oral and Maxillofacial Surgery, Mahatma Gandhi Dental College and Hospital, Jaipur , Rajasthan. All patients and their attendants were informed about the surgical procedure, postoperative care, and possible complications. Informed consent was obtained for cyst enucleation with defect reconstruction using a tibial cancellous bone graft under general anesthesia.

CASE 1 :

A 37 year old male, reported to the Oral and Maxillofacial Surgery Department with the chief complaint of pain & swelling with respect to upper right front teeth since past 1 month. Patient was apparently asymptomatic 1 month back. Patient had a history of endodontic treatment , root canal treatment in relation to 11 and 12 teeth, also revealed that swelling increased gradually over a period of 10-15 days and is associated with dull, intermittent and non - radiating pain.

Patient had history of trauma while playing in 2008 following which upper front tooth was fractured .

On clinical examination, **Extraoral finding** shows bilateral symmetrical facial symmetry with mouth opening – 3 fingers. **Intraoral examination** displayed swelling in right maxillary region extending from mesial aspect of 11 to distal aspect of 14. Measuring diameter was around 2cm in size. Swelling was soft, non-compressible, non-fluctuant, non-pulsatile in nature. Vestibular obliteration seen. 11,12 teeth were non – vital.

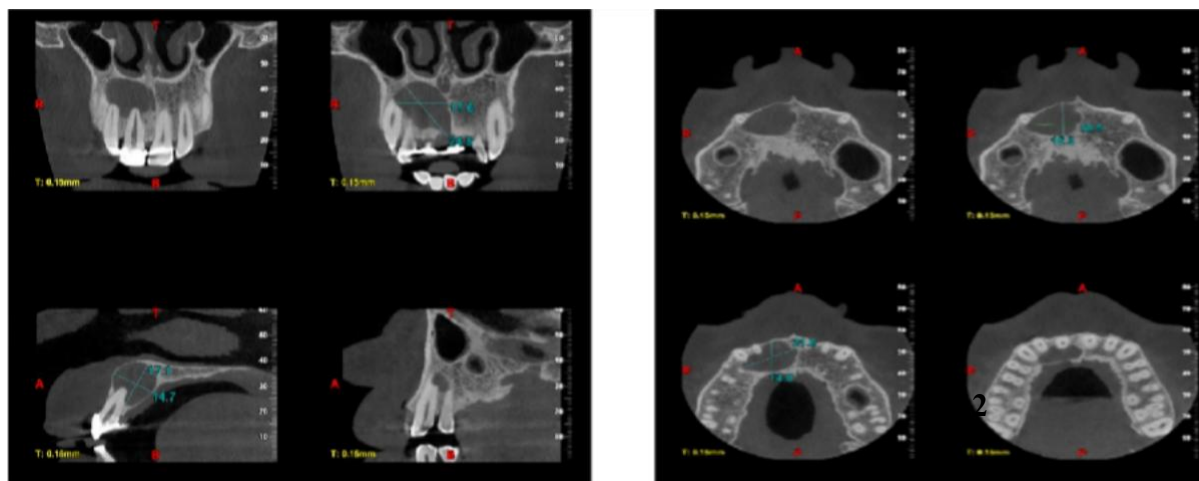


Fig 1 : Cone Beam – Computed Tomography

Intraoral periapical radiographs revealed a well-defined radiolucency in the periapical region associated with teeth 11 and 12, with well-defined, corticated margins. Root resorption and an open apex were also observed in tooth 11.

Coronal and Axial cuts of cone beam computed tomography (CBCT) showed a unilocular large well defined corticated radiolucency extending from 11 to distal aspect of root of 14 measuring 24.5 x 17.6mm (coronal section), 18.5x15.3 mm in (axial section) .

Patient and attenders were informed about surgery, postoperative care & possible complications . Informed consent was taken to perform the surgery for cystic enucleation along with defect fill with cancellous bone graft

(tibial) under general anaesthesia.

Surgical procedure :

Operative procedure were carried out under general anaesthesia, patient was intubated left nasally. Painted and draped at both recipient and donor site. The knee and proximal tibial region were disinfected twice with an antiseptic preparation, and the operative field was subsequently draped in a sterile manner. Right upper crevicular incision given to expose cystic lesion. Full thickness mucoperiosteal flap with adequate bony access over cyst was raised. Entire cystic lining removed. Lesion exposed and enucleation done.

The skin at the proximal tibia was disinfected and draped , had been harvested in cases using the medial approach under tourniquet control.

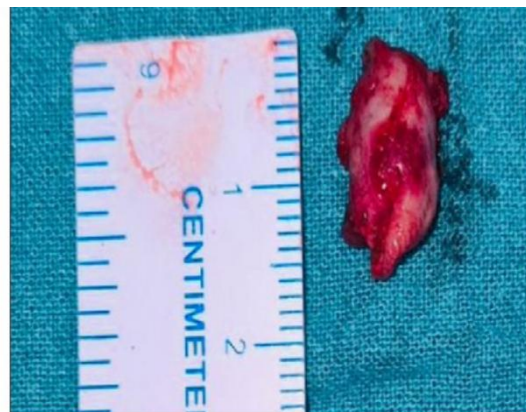
After infiltrating the incision site with 2% lidocaine with noradrenaline (1:100,000), a 1-1.5cm incision was made 2 cm below & 2 cm medial to tibial tuberosity. Skin was retracted & the periosteum was elevated for bone access using periosteum elevator, soft tissues were retracted.

A cortical window was created and was osteotomized. Cancellous bone was harvested by using bone scoop. The harvested bone was used for grafting, and any cortical bone removed was milled and mixed with the cancellous graft.

Closure was done by using vicryl 2-0, 3-0 absorbable sutures. Sterile dressing was applied.



a)



b)



c)



d)

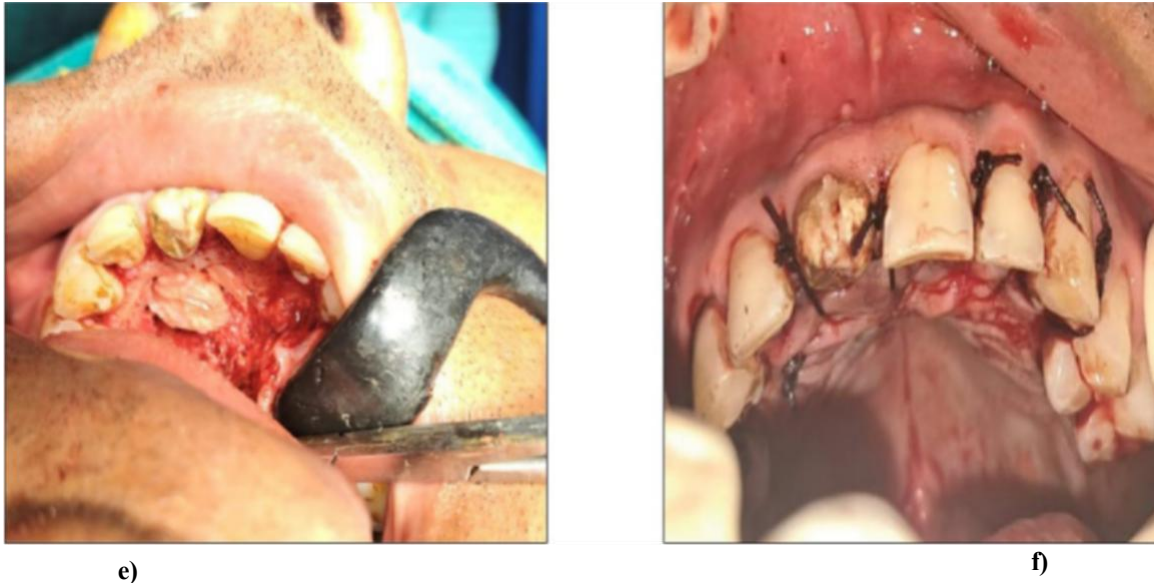


Fig 2 : a) Cystic cavity exposed , b) Cystic lesion , c) Cortical window created , d) Tibial bone Postoperative Care harvest , e) Graft placed in cystic cavity , f) Closure done

Post operatively, an elastic bandage was applied from the foot to the knee to minimize hematoma risk. Patient was restricted from engaging in excessive weight-bearing activities, such as jumping, running, or climbing ladders, for two months. Additionally, the patient was restricted to a soft diet and advised to avoid biting hard substances with his anterior teeth.

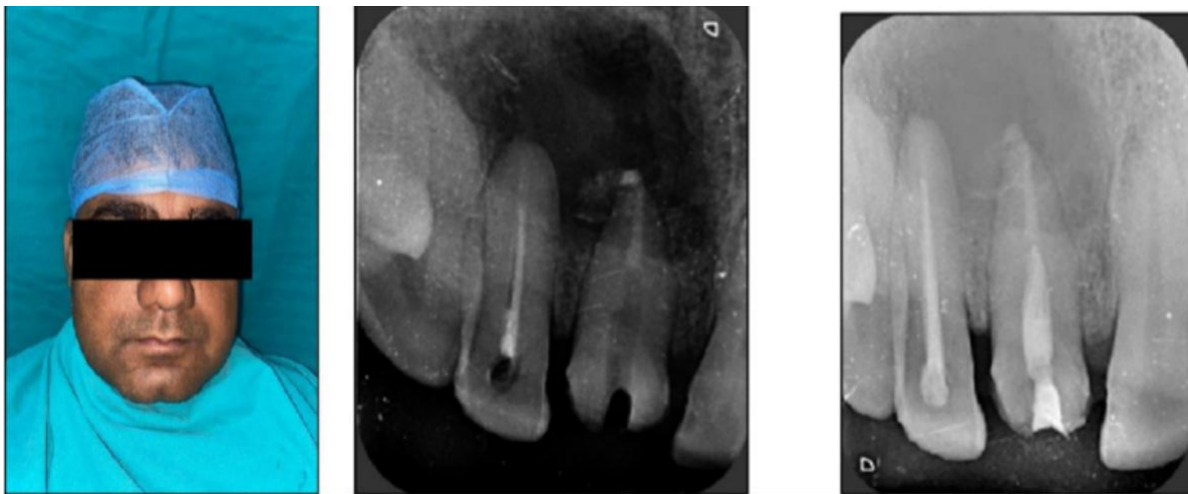


Fig 3: Pre and Post 1 month IOPA in relation to 11, 12



Fig 4: 1 month follow up tibial X ray

A control X-ray of tibia was conducted to verify proper formation of cortical bone window and to check the presence of any fractures or cracks. Postoperatively, sutures were removed between 10 to 15 days. Postoperative monitoring involved appointments at 1st, 3rd, and 6th months to assess both the donor and recipient sites for any complications. Each visit included an evaluation of the donor site's skin scar and a detailed review of the patient's recovery. Patient was advised to avoid high-impact activities for up to 2 months to promote optimal bone healing and prevent rare donor site fractures.

CASE 2 :

A 20 yrs / female, reported to the Oral and Maxillofacial Surgery Department with the chief complaint of swelling in left buccal vestibular region since 2-3months. Swelling is 1cm x 1 cm in size , gradually increased in 21 to 23 teeth region and is not associated with any pus or blood discharge. On clinical examination, **Extraoral finding** shows bilateral symmetrical facial symmetry. **Intraoral examination** shows buccally swelling in left maxillary region extending from mesial aspect of 21 to distal aspect of 23 tooth region.

Patient was planned for cyst enucleation under general anaesthesia after completion of routine preoperative investigations and fitness assessment. A crevicular incision with vertical releasing cuts was made in the left buccal vestibular region to gain adequate access to the lesion. The After careful elevation of the mucoperiosteal flap, the lesion was entirely enucleated the cystic lesion was performed. Tibial bone graft harvested from left leg and placed in cystic cavity. Flap was repositioned and sutured primarily. The excised lesion was preserved in a 10% formalin solution and sent to the pathology laboratory for histological assessment. Postoperative management included antibiotics, analgesics, and antiseptic mouth rinse, with regular follow-up to assess healing and monitor for recurrence.

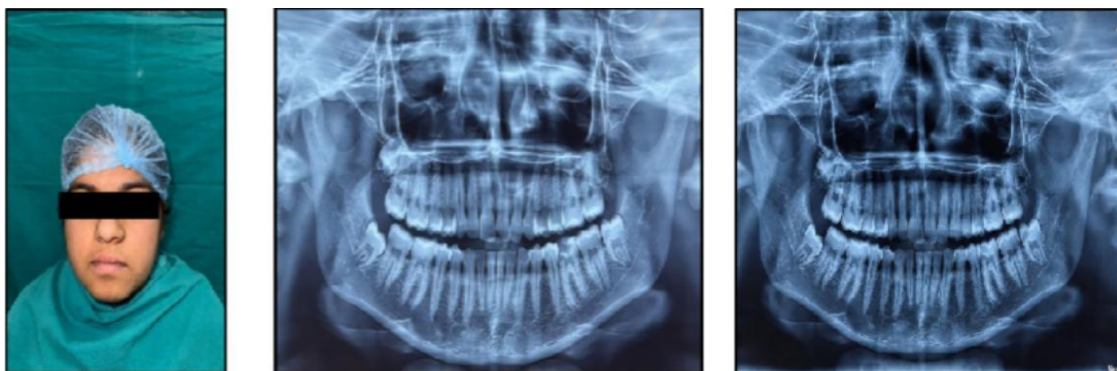


Fig 5: Pre op and Post op OPG

CASE 3 :

A 41 yrs / male , reported to the Oral and Maxillofacial Surgery Department with the chief complaint of upper front tooth region since 6-7 months. Pain is dull aching , intermittent, non – radiating in nature. Patient gives history of pus discharge in relation to upper anterior tooth region since 6-7 months. Patient also gives a history of trauma 30 years back. On clinical examination, **Extraoral finding** shows bilateral symmetrical facial symmetry. **Intraoral examination** shows ellis class IV fracture in relation to 11 with grade II mobility in relation to 11 tooth.

The cystic lesion was surgically managed under general anaesthesia after all necessary investigations and pre-anaesthetic evaluations had been completed. A crevicular incision with vertical releasing extensions was placed in the right buccal region to provide optimal access to the lesion site. The mucoperiosteal flap was elevated carefully, and the cyst was completely enucleated followed by extraction of 11 and 12 teeth. Tibial bone graft harvested from left leg and placed in cystic cavity. Flap was then repositioned and sutured primarily. The excised tissue was submitted for histopathological examination after fixation in 10% neutral buffered formalin, followed by placement of a dental implant in the area corresponding to teeth 11 and 12. Postoperative care comprised antibiotic and analgesic therapy along with antiseptic mouth rinses, and the patient was scheduled for regular follow-up to evaluate healing and detect any signs of recurrence.

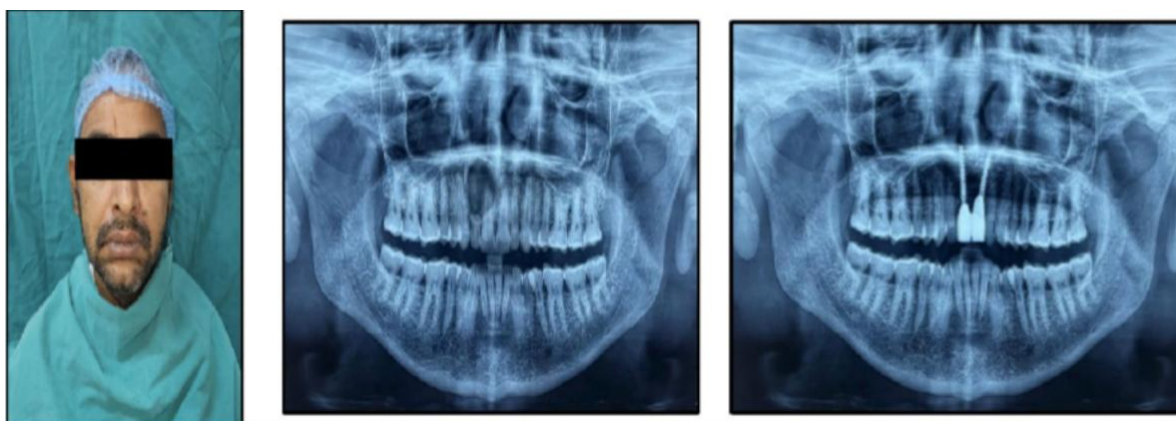


Fig 6 : Pre op and Post op OPG

CASE 4:

A 23 yrs / male, reported to the Oral and Maxillofacial Surgery Department with the main complaint of swelling in upper left tooth region since 3 months. Swelling gradually increased in size over time, is not associated with any blood or pus discharge. Patient had a history of endodontic treatment , root canal treatment in relation to 21 and 22 teeth. **Extraoral findings**

- facial asymmetry present. **Intraoral examination** shows buccally swelling in left maxillary region extending from mesial aspect of 21 to distal aspect of 24 tooth region.

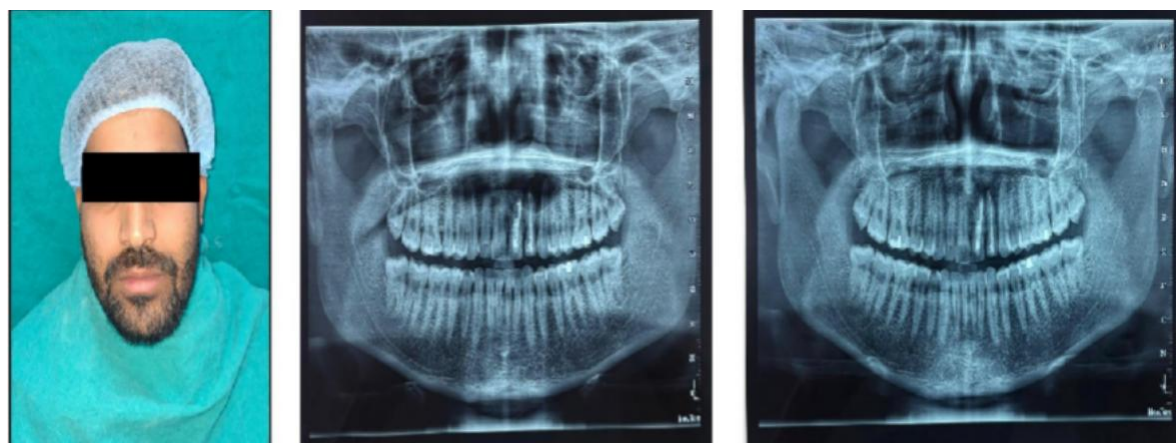


Fig 7 : Pre op and Post op OPG

The patient was scheduled for cyst enucleation under general anaesthesia following completion of routine preoperative investigations and confirmation of fitness for surgery. A crevicular incision with vertical releasing extensions was made in the left buccal area to ensure adequate exposure of the lesion. After careful elevation of the mucoperiosteal flap, complete enucleation of the cystic lesion was achieved. Tibial bone graft harvested from left leg and placed in cystic cavity. Flap was repositioned and sutured primarily. The surgically removed specimen was immersed in 10% neutral buffered formalin and forwarded for histopathological assessment. Postoperative care included administration of antibiotics, analgesics, and antiseptic mouth rinses, with periodic follow-up visits planned to evaluate healing and detect any signs of recurrence.

CASE 5 :

A 14 yrs / female reported to the Department of Oral and Maxillofacial Surgery with a chief complaint of persistent food impaction and nasal regurgitation of liquids since birth. Also associated with hyper nasal speech and difficulty in swallowing food . Patient was an operated case of primary cleft lip closure at age of 2 yrs followed by operated for cleft palate repair at the age of 4.5yrs. On clinical examination, **Extraoral finding** shows bilateral asymmetrical facial symmetry. **Intraoral examination** shows palatal opening present between palatal alveolar mucosa of teeth in relation to 11 and 21, of around 0.5cm diameter in size.

The patient was scheduled for secondary alveolar bone grafting under general anaesthesia following completion of routine preoperative investigations and confirmation of fitness for surgery. Left vestibular incision given from 21 to 24 teeth region. Defect site exposed by periosteal flap reflection. 1.5 cm long incision marked 15 mm away from tibial tuberosity of left leg. Incision given , layer by layer dissection done. Cortical bone of size 2 * 2 cm removed. Window created and cancellous bone with marrow harvested and placed in defect site. Primary closure done in relation to palatal fistula in relation to 11, 21 teeth region. Donor site closure done in layers. Postoperative care included administration of antibiotics, analgesics, and antiseptic mouth rinses, with periodic follow-up visits planned to evaluate healing and detect any signs of recurrence.



Fig 8 : Pre op and Post op clinical photos

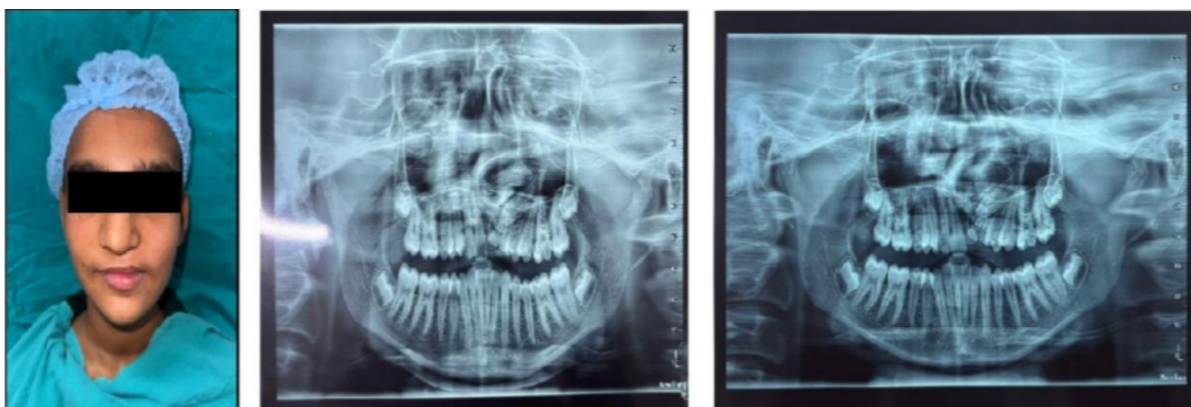


Fig 9 : Pre op and Post op OPG

III. DISCUSSION:

Cyst enucleation in the maxillary area is surgically complex because of the difficult anatomy and the nearby location of important structures like the maxillary sinus and nasal cavity. It is critical to completely remove the cyst to prevent it from returning, while also protecting the surrounding bone and soft tissues to ensure the best possible healing and function. When the resulting bone defect is large, natural bone regrowth may be too slow or insufficient, which increases the risk of problems after surgery, such as infection or issues with future dental restoration. The key factors for choosing bone graft donor site are size & shape of resulting void, as these determine how much bone is needed therefore, **extraoral donor sites** are generally chosen for larger bone additions to the jaw and major reconstructions.⁵

Historically, the **iliac crest** has been the standard extraoral location for obtaining large volumes of bone graft needed for pre-prosthetic or major reconstructive surgery. Nevertheless, harvesting bone from this site carries a relatively increased risk of complications and patient discomfort (**morbidity**) compared to taking bone from the tibia. The **proximal tibia** offers an excellent supply of **cancellous bone**, its use has been supported by many surgeons for reconstruction in the oral cavity. The excised lesion was preserved in a 10% formalin solution and sent to the pathology laboratory for histological assessment.⁶

The use of a patient's own (autogenous) tibial bone grafts for rebuilding bone after a cyst has been removed (enucleation) offers several distinct benefits. Tibial grafts supply a generous quantity of both cortical and cancellous bone, which have excellent biological properties they are osteoconductive (provide a scaffold for new bone), Oste inductive (contain factors that stimulate new bone growth), and osteogenic (contain living bone-forming cells). These properties contribute to faster and more reliable bone regeneration at the defect site.⁷ Furthermore, the tibia is favoured because it provides a high volume of cancellous bone through less traumatic surgical approach, leading to relatively low donor site morbidity (fewer complications and less pain) compared to alternative sites like the iliac crest.

The medial approach to bone harvesting provides several benefits, including improved access to the surgical site, decreased risk of damage to critical anatomical structures, and lower postoperative morbidity.⁸ This approach is preferred because it is located away from critical anatomical structures. In contrast, the lateral approach lies closer to important elements such as the articular surface, the tibialis anterior muscle, and the recurrent tibial vessels, and it is situated within the anterior compartment, making it comparatively riskier.

According to literature, accessing the medial proximal tibia for cancellous bone harvesting was easy and rapid, with no encounter of critical anatomical structures. Ultimately, in specific case described, tibial bone graft successfully restored bony structure of the right maxilla, showing good integration and healing after the procedure.

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Wang et al. an average of 77 cm² of cancellous bone was reported as available for harvesting from the proximal tibia, representing approximately a two- to three-fold increase over the accepted average bone volume.

Herford et al. conducted a cadaveric study comparing lateral and medial approaches. Although the mean volume of bone harvested was similar for both techniques, the medial approach demonstrated several advantages, including easier access, a lower risk of damage to anatomical structures, and reduced postoperative morbidity. Additionally, in the medial approach, the bone is closer to the skin surface, facilitating easier harvesting.¹⁰

Secondary alveolar bone grafting (SABG) remains a critical component in comprehensive management of patients with cleft lip & palate, aimed at restoring alveolar continuity, providing bony support for the eruption of adjacent teeth, and facilitating orthodontic treatment. The ideal timing, typically between 9 and 12 years of age, coincides with the mixed dentition period and the eruption of the permanent canine, thereby ensuring maximum functional and aesthetic benefit. Iliac crest cancellous bone continues to be considered the gold standard graft material due to its excellent osteogenic potential, although alternative graft sources and biomaterials have gained attention for reducing donor-site morbidity. Surgical success depends on meticulous soft tissue management, adequate preoperative orthodontic preparation, and postoperative maintenance of graft stability. The outcomes of SABG significantly influence facial symmetry, alveolar arch form, and prosthodontic rehabilitation options, thereby improving the overall quality of life for cleft patients.

Current literature supports using bone grafts alongside cyst removal (enucleation) to speed up healing and shorten the time needed for bone regrowth. Research indicates that combining grafting techniques with guided bone regeneration (GBR) protocols significantly enhances both the quality and volume of bone restored after cyst

removal, which is especially important in regions requiring good aesthetic and functional results. This combined strategy is also crucial for preserving the alveolar contour (the shape of the jawbone ridge), which makes future dental procedures, such as placing implants, much easier if required.

Conclusion, repairing the bone defect in the maxillary area after cyst removal using an autogenous tibial bone graft proves to be a reliable and effective treatment. This approach encourages rapid healing, provides necessary structural stability, and helps minimize complications after surgery. Crucially, long-term follow-up is necessary to monitor how well the graft integrates and to quickly manage any issues, thereby guaranteeing lasting functional and aesthetic outcomes.¹¹

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