# Gorlin-Goltz Syndrome – A Concatenation of Six Case Reports

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## Abstract

**Rationale:** Gorlin-Goltz syndrome (GGS) has a wide range of expressivity, with a majority of cases being first diagnosed from the oral findings. Early intervention can reduce its severity. **Patient Concerns:** The primary complaints of all the patients were pain and swelling. Clinical examination with radiological and histopathological evaluation confirmed the diagnosis. **Diagnosis:** This series presents the six cases of GGS treated over a time frame of five years (2018–2022). **Treatment:** The treatments range from enucleation, chemical cauterisation and peripheral ostectomy to aggressive modalities such as resection and reconstruction. **Outcomes:** This series comprises of six patients with ages ranging from 12 to 42 years, four of which were female and two were male presenting minimal expression to highly aggressive forms and its unpredictable frequent manifestation. **Take-Away Lessons:** This emphasises the significance of long-term periodic follow-up and genetic screening for early detection, thereby reducing the intensity and aggressiveness of the disease.

**Keywords:** Genetic screening, Gorlin-Goltz syndrome, odontogenic keratocyst

## Introduction

Gorlin-Goltz syndrome (GGS) is an autosomal dominant condition with wide-ranging expressivity and significant penetrance. Although it has a prevalence of 1 in 57,000–64,000 worldwide, it has been seldom recorded in the Indian setting.[1]

The pathophysiology is linked to the deletion of the long arm of chromosome 9(q22.3-q31) PTCH1 gene and alterations in the associated genes such as smoothened and sonic hedgehog gene.[2] Genetic screening and mapping will aid in the early detection of its presentation and subsequent management, thereby decreasing the morbidity.[3]

Here, we present a series of six GGS cases diagnosed in our department over a time frame of five years (2018–2022), highlighting the varied clinical expressions and the surgical modalities available to treat them.

## Case Reports

### Case 1

A 24-year-old female patient reported with a complaint of pain and swelling in the right maxilla. Intraoral examination revealed tenderness on percussion in 13, 14, 15 and 16. Orthopantomogram (OPG) revealed multiple radiolucencies in the bilateral maxilla and left angle of the mandible with associated impacted teeth [Figure 1a]. On extraoral examination, hypertelorism and multiple palmar and plantar pits were noted. Computerised tomography (CT) scan revealed calcification of the falx cerebri. Chest X-ray revealed bifid ribs. Enucleation and chemical cauterisation were done with the extraction of 13 and 25 [Figure 1b]. Histopathology confirmed parakeratinised odontogenic keratocyst (OKC). The patient is on regular follow-up for five years with no recurrence [Figure 1c].

### Case 2

A 42-year-old female, mother of Case 1, was screened for familial correlation. Chest X-ray showed bifid 9$^{th}$ and 11$^{th}$ ribs. OPG revealed the presence of multiple radiolucencies in the right mandible. Incisional biopsy revealed parakeratinised OKC. Enucleation of the lesion [Figure 2a and b] was done.

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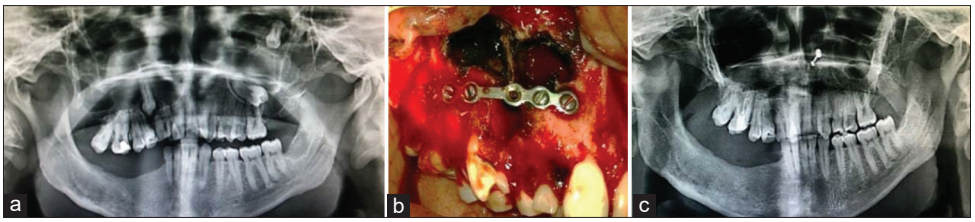

**Figure 1:** Case 1 - (a) Pre-operative orthopantomogram showing multiple impacted teeth and associated radiolucencies, (b) Cyst enucleation and chemical cauterisation with Carnoy's solution with miniplate in the maxilla, (c) 5-year post-operative orthopantomogram

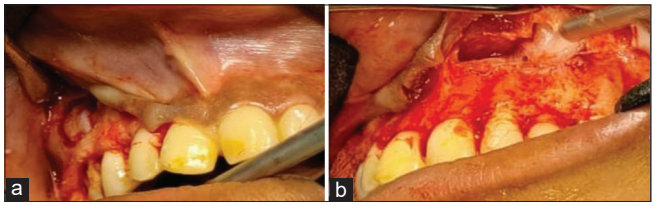

**Figure 2:** Case 2 - (a) Cyst enucleation in the right maxilla, (b) Cyst enucleation in the left maxilla

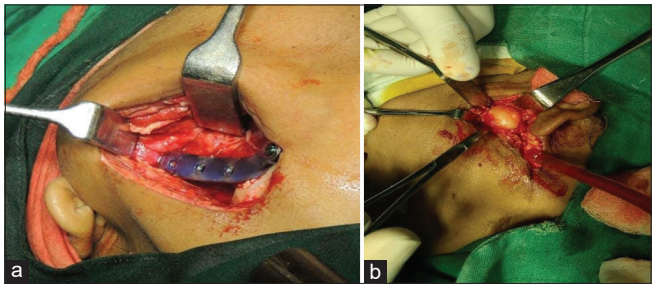

**Figure 3:** Case 3 - (a) Segmental resection with reconstruction plate on the right side, (b) Surgical removal of odontogenic keratocyst from the pre-auricuar region

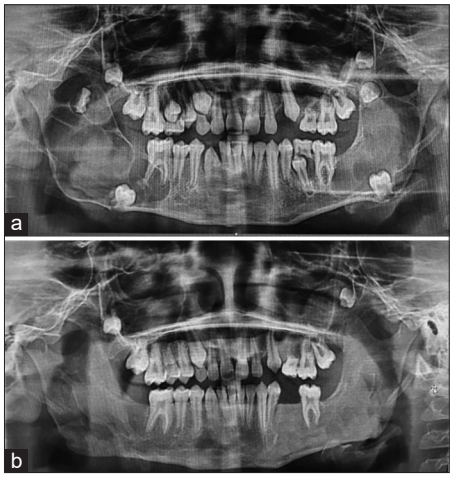

**Figure 4:** Case 4 - (a) Orthopantomogram showing extensive involvement of bilateral angle-ramus-condyle region with multiple unerupted and displaced teeth, (b) Post-operative follow-up after 1 year

## Case 3

A 30-year-old female patient reported with swelling and pain in both sides of the face. OPG revealed multiple radiolucencies in the left maxilla and mandible. Extraoral examination revealed polydactyly in both feet. Chest X-ray revealed bifurcation of the fourth rib.

The patient reported back with recurrence of the lesions but deferred from further treatment. In the year 2019, the patient exhibited severe pain and associated swelling in bilateral mandible. OPG revealed extensive involvement of the right angle-ramal region, left posterior maxilla and left condylar region. CT showed extensive cortical destruction in bilateral mandible. Segmental resection was done for the right side and a reconstruction plate was placed [Figure 3a]. Enucleation and chemical cauterisation were done for the left maxilla and left condylar region. In 2022, she again reported with swelling in the left pre-auricular region and pain in the left body of the mandible. CT scan revealed radiolucent lesion in the left pre-auricular region. Surgical excision of the lesion in toto was carried out with chemical cauterisation using Carnoy's solution [Figure 3b]. The patient is being followed up.

## Case 4

A 12-year-old child, the son of the patient mentioned in Case 3, was screened for the presence of a similar condition. OPG revealed extensive multilocular scalloped radiolucencies in the bilateral ramal region and symphysis region with multiple unerupted teeth [Figure 4a]. CT showed extensive destruction of cortical bone in bilateral ramus and body region. Incisional biopsy was suggestive of parakeratinised OKC. Extraorally, the patient presented with multiple palmar and plantar pits. Chest X-ray showed bifid sixth rib. Enucleation and chemical cauterisation with Carnoy's solution were done with peripheral ostectomy. The patient was followed up for five years with no recurrence [Figure 4b].

## Case 5

A 14-year-old male patient reported with a complaint of pain and associated swelling in the left posterior mandible in 2017. OPG revealed multilocular radiolucencies in the right maxilla and bilateral angle-ramal region associated with multiple unerupted teeth [Figure 5a]. Incisional biopsy suggested parakeratinised OKC. Chest X-ray showed bifid fourth rib. The patient was treated with enucleation. In 2019, the patient reported with the recurrence of the lesion in the same region. The lesion was enucleated and chemical cauterisation was done with Carnoy's solution. The patient reported again in 2021 with a new lesion in right body of the mandible [Figure 5b], and the patient was lost for follow-up due to COVID-19.

**Table 1: Summary of diagnostic findings and treatment done**

| Case number | Age/sex | Major criteria | Minor criteria | Other findings | Recurrence/ new lesion | Treatment done |
|---|---|---|---|---|---|---|
| Case 1 | 24/female | Multiple OKC, palmar and plantar pits, calcification of the falx cerebri, first-degree relative | Hypertelorism<br>bifid ribs | Sibling diagnosed with dysgenetic polycystic disease of parotid gland<br>Retained deciduous teeth<br>Multiple impacted teeth<br>Tooth displaced to the roof of maxillary sinus<br>daughter of Case 2 | No | Cyst enucleation and chemical cauterisation with Carnoy's solution<br>Miniplates fixation in right maxilla |
| Case 2 | 42/female | Multiple OKC<br>First-degree relative | Bifid ribs | Multiple impacted teeth | No | Enucleation of cysts |
| Case 3 | 30/female | Multiple OKC, first-degree relative | Bifid ribs, polydactyly | Mother of Case 4<br>Multiple impacted teeth | Yes (multiple, 5) | Enucleation with bone grafting<br>Enucleation with chemical cauterisation using Carnoy's solution and peripheral ostectomy of left side<br>Segmental resection with reconstruction plate on right side<br>Surgical excision of lesion with chemical cauterisation using Carnoy's on left side. Enucleation with chemical cauterisation and peripheral ostectomy on right side |
| Case 4 | 12/male | Multiple OKC, first-degree relative, palmar and plantar pits | Bifid ribs<br>Frontal bossing | Multiple impacted and displaced teeth<br>Retained deciduous | No | Enucleation with chemical cauterisation using Carnoy's solution with peripheral ostectomy |
| Case 5 | 14/male | Multiple OKC, plantar pits | Bifid ribs | Retained deciduous teeth | Yes (multiple, 3) | Enucleation<br>Enucleation and chemical cauterisation with Carnoy's solution |
| Case 6 | 26/female | Multiple OKC | Frontal bossing, bifid ribs syndactyly | Retained deciduous teeth | No | Enucleation and chemical cauterisation with Carnoy's solution |

OKC: Odontogenic keratocyst

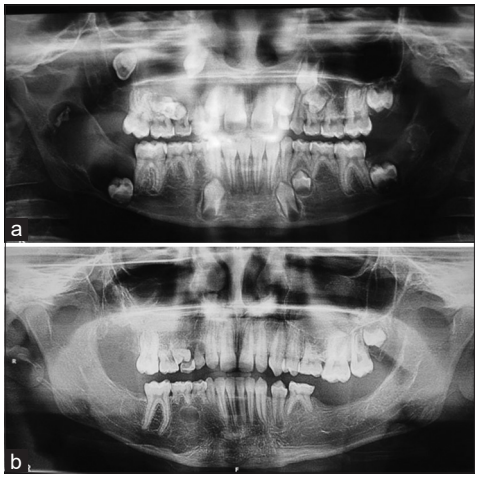


**Figure 5:** Case 5 - (a) Orthopantomogram showing multilocular radiolucencies in the right maxilla and bilateral angle-ramal region associated with multiple unerupted teeth, (b) New lesion in the right body of the mandible

## Case 6

A 26-year-old female reported with swelling and pain in the left side of her face. Intraorally, the buccal vestibule of the left mandible was obliterated. OPG showed multilocular radiolucencies in both jaws. Teeth 15, 25 and 37 were impacted. Teeth 18, 14 and 45 were missing [Figure 6a]. The cone-beam CT reports showed extensive bone destruction. Histopathological reports were suggestive of parakeratinised OKC. The patient presented with frontal bossing and syndactyly in right hand. CT showed calcification of the falx cerebri. Impacted 15 and 25 were extracted. Enucleation followed by chemical cauterisation was done [Figure 6b and c]. Post-operative OPG showed no recurrence of the lesion in the next two years.

In all the cases, the diagnosis of GGS was made based on the criteria suggested by Kimonis *et al*.[4] Screening was advised for children of affected parents and vice versa for early diagnosis and intervention.

Table 1 gives the summary of diagnostic findings and associated treatment done.

## Discussion

The incidence of GGS is estimated at 1 in 50,000–150,000 in the general population with a minimum prevalence of 1


**Figure 6:** Case 6 (a) Orthopantomogram showing multiple radiolucencies in all four quadrants, (b) Enucleation with chemical cauterisation of bilateral maxillary lesion, (c) Enucleation with chemical cauterisation of left mandibular lesion

in 64,000, 1 in 560,000 and 1 in 256,000 in Australia, the United Kingdom and Italy, respectively.[5]

Despite the established Kimonis criteria, the aggression with which the lesion may spread cannot be mapped and there is decreased awareness amongst the Indian population about this syndrome.[6]

Lata *et al*. in their case series of GGS in the Northern population comparing Indian literature and worldwide, it is suggested that there is a substantial difference between distinct ethnic groups and a sizable variation in the way the syndrome presents in the same population.[7]

A 5-year initial follow-up, and thereafter, every two years of follow-up are advisable as OKC has 60% of recurrence rate in syndromic cases compared to 28% in non-syndromic cases. These recurrences are usually reduced by the expertise and experience of the surgeon, good access, complete removal of the friable lining and removal of daughter cysts if any.[8]

These recurrences vary from 30% after enucleation, 14.5%–38% after enucleation and cryotherapy, 18% after enucleation with peripheral ostectomy and 8% after enucleation coupled with Carnoy's solution.[9]

Analysing the findings of the present case series with other existing reports in Indian literature, one of our patients had polydactyly, two of the patients had frontal bossing and calcification of the falx cerebri, familial history was noted in four of the patients and all the cases had palmar and plantar pits and bifid ribs.[10]

Our series thus corroborate with the current beliefs about the syndrome and describe the importance of a judicious multimodal planning and treatment.

## Conclusion

GGS has a wide variety of manifestations and, in a large proportion of cases, it is first diagnosed from oral findings. Usually, patients with GGS present multiple OKCs; however, even when a patient has a single OKC, possibly because it is an initial manifestation, the suspicion that it is part of the syndrome should be investigated. Genetic screening and counselling help in the early diagnosis and management of suspected disease, thus decreasing the severity of abnormalities. A thorough follow-up regimen for people having this condition needs to be followed to decrease the severity and aggressiveness of the lesion.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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