> Gardner’s syndrome (GS) is an autosomal dominant disease characterized by the presence of familial adenomatous polyposis (FAP) as well as extraintestinal manifestations such as osteomas, dental anomalies, epidermoid cysts and ocular abnormalities. These intestinal polyps carry a 100% risk of malignant change, so early diagnosis is crucial. As craniofacial osteomas and dental anomalies of GS usually precede gastrointestinal symptoms, otolaryngologists, oral surgeons and dentists play an important role in the diagnosis of GS. GS is extensively reported in literature in the Caucasian race but not in the Mongoloid race. We report a case of a 22-year-old patient with a manifestation of three features of GS – multiple osteomas, soft tissue tumors and dental anomalies in the craniofacial region, with no intestinal polyps at the time of reporting. A family pedigree with our patient as the proband was constructed and revealed 3 consecutive generations in his lineage with GS.<

**Key words:** Familial adenomatous polyposis, Gardner’s syndrome, osteomas.

**Introduction**

Gardner’s syndrome (GS) is a subgroup of familial adenomatous polyposis (FAP), comprising approximately 10% of FAP patients [1]. It is a rare autosomal dominant inherited disease characterized by the presence of multiple polyps in the intestine as well as bony, cutaneous, dental, and ocular abnormalities [2], due to mutations of the *adenomatous polyposis coli* (*APC*) gene on chromosome 5q21-22. There is almost complete penetrance of the intestinal phenotype but variable penetrance of the extraintestinal features. GS is extensively reported in literature in Caucasians but not in Mongoloids. The incidence of FAP is between 1 in 8,300 and 1 in 14,025 births, affecting both genders equally, with a uniform worldwide distribution [3].

FAP is characterized by adenomatous polyps of the colon and rectum with 100% potential of malignant change. This is a maliciously premalignant disease with polyph(s) showing dysplasia and progressing to malignancy in untreated gene carriers, diagnosed at a median age of 40 years [1]. Carcinoma may develop at any age from the second to the seventh decade [1]. The clinical diagnosis of GS is often difficult due to the great variation in the extra-intestinal clinical features [1]. Some patients have only 1 or 2 abnormalities while others show all or many of the characteristic features [4]. The lesions present themselves in a different chronological order, but typically, cutaneous and bony lesions appear 10 years earlier than intestinal polyposis [5]. As craniofacial bony and dental signs of GS often precede gas-
trointestinal symptoms [2], otolaryngologists, oral surgeons and dentists may play an important role in the diagnosis of FAP, and may potentially save the lives of these patients and their family. Osteomas are usually located in the jaws and frontal bone. Dental anomalies include impacted teeth, supernumerary teeth, odontoma, and congenitally missing teeth. The simultaneous presence of osteoma(s) with dental anomalies with is highly suggestive of underlying GS [6].

We present a Chinese patient with GS who was the proband in his family, from which further investigations allowed the diagnosis of the disease across 3 generations.

Case Report

A 22-year-old Chinese man was referred to us for multiple osteomas of the facial bones for the past 7 years, which had increased gradually in size, posing to be a major esthetic problem. A detailed history taking revealed chronic hematochezia and the presence of soft tissue lumps in his scalp (Figure 1A) and scrotum. Further probing elicited that his elder sister and father had multiple bony swelling of the jaws and skull along with colorectal adenomatous polyposis, and his father had undergone colectomy.

General examination showed multiple nodular formations in the frontal and bilateral mandibular region leading to a facial dysmorphism. On palpation, these tumors were hard, well defined, and immobile. Panoramic radiograph showed multiple radiopaque masses and impacted teeth in the jaws (Figure 2A). The computed tomography (CT) scan showed numerous osteomas of different sizes located on the mandible, as well as all over the calvaria (Figure 2B).

The proposed treatment plan was excision of the major osteomas via an external approach under general anesthesia. The major osteomas located at bilateral mandibular angles and rami were removed via sub-mandibular approach. This access allowed sufficient exposure of most osteomas on the mandibular ramus and angle (Figure 3A). The resection of these osteomas was difficult due to its very hard cortical nature (Figure 3B). The smaller osteomas were not removed as they were insignificant to the objective of improving the mandibular contour of the patient. The wounds were closed and suction drains were left for 3 days. The resected specimens were sent for histopathological analysis. Histopathological results revealed that the osteomas contained osseous nodules with irregular Haversian canals without any osteoclasts or osteo-

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**Figure 1.** (A) View of the patient showing two soft tissue lumps in his scalp. (B) Histopathological results revealing the epidermoid cyst with pilomatricoma-like changes (hematoxylin-eosin stain, 5x). (C) A colonoscopy showing normal colonic mucosa.

**Figure 2.** (A) Panoramic radiograph showing widespread radiopaque lesion and multiple impacted permanent teeth. (B) A preoperative CT view of multiple nodular lumps throughout the jaws and skull surface. (C) A postoperative CT showing a smooth counter line of mandible.
GS results from the mutation on the APC gene, which is located on the long arm of chromosome 5 (5q21-22). The APC gene was identified in 1991 and modifier genes responsible for the development of the extraintestinal manifestations are currently still enigmatic. In approximately 75% of the cases, a defective gene is inherited from one of the parents. In the remaining 25%, the mutations are sporadic [1]. Over 300 different mutations have been reported [3]. Using molecular genetic techniques, doctors can screen for the pre-symptomatic members of a family carrying the mutated APC gene. As a guideline, the offspring of individuals suffering from the syndrome should undergo a comprehensive examination on their tenth and fifteenth birthdays [1].

As a guideline, the offspring of individuals suffering from the syndrome should undergo a comprehensive examination on their tenth and fifteenth birthdays [1]. Usually appearing between 13 and 31 years of age, adenomatous polyps can occur anywhere in the gastrointestinal tract except the esophagus, normally in the colon and the rectum. Gastric polyps are rare. These polyps can cause diarrhea, constipation, intestinal pain, or rectal bleeding. The adenomatous polyps are associated with colossal risk (almost 100%) of malignant degeneration if they are not resected [1].

Malignant changes occur within 10 to 15 years after the onset of the lesions [7]. On the average, degeneration

Discussion

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Osteomas are benign tumors which may cause disfigurement and dysfunction and are associated with a low rate of malignant transformation and post-resection recurrence rate. Oliveira et al. [12] reported a case of limited mouth opening due to bilateral coronoid hyperplasia that was later diagnosed to be GS. Surgical treatment of osteomas with dysfunction is necessary. Jaw lesions grow gradually in childhood and adolescence and continue to develop in adulthood. Periodical radiographic examination of the jaws is recommended during postoperative follow-up [13]. As our patient's concerns were primarily esthetic, only osteomas on bilateral rami and angles were resected. The patient was satisfied with the result.

GS is associated with dental anomalies such as supernumerary teeth, congenitally missing teeth, impacted teeth and odontoma which can be picked up by routine radiographs. Dental anomalies are present in 30-75% of GS patients. In some cases, the preliminary diagnosis of GS is made by dentists. The most common ectodermal abnormalities of GS are epidermoid cysts, frequently associated with lipoma, desmoid tumors, fibroma, leiomyomas, neuro-fibroma, or pigmented skin [1]. Epidermoid cysts are present in approximately 50-65% of patients, arising prior to puberty and occur primarily on the face, scalp and extremities, with no malignant potential [14]. Although the diagnosis of GS can only

![Figure 4. The family tree showing affected members.](https://doi.org/10.1051/medsci/201834f104)
be confirmed by gastrointestinal endoscopy and molecular genetic analysis, it may be guided by immune-histochemical profile of extra-intestinal lesions. A fibroma with tumor cells stained by anti-CD34 and beta-catenin antibodies would suggest a Gardner fibroma [15].

In this reported case study, four family members died of intestinal cancer without the diagnosis of GS. The diagnosis of GS was never known until the patient was referred under our care. He presented with multiple osteomas and dental anomalies in the craniofacial region along with epidermoid cysts, with no intestinal polyps currently. A literature search returned 18 well-documented cases of GS which reported clearly the first clinical feature(s), which may include osteomas, epidermal cysts, FAP, desmoid tumors, dental anomalies and/or adenocarcinoma of the rectum (Table 1). Osteomas and dental anomalies present as the first clinical signs of GS in 53% of these cases. To avoid missing the diagnosis of GS, it is important for otolaryngologists, dentists and oral surgeons to be familiar with the common manifestations of GS. ◊

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Age/Gender</th>
<th>First clinical feature(s)</th>
<th>Country</th>
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<tr>
<td>#1 Oliveira et al [12]</td>
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<td>Epidermal cysts</td>
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<td>#3 Álvarez Salgado JA et al [17]</td>
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<td>#4 Verma P et al [18]</td>
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<td>#18 de Oliveira Ribas M et al [31]</td>
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<td>Osteomas and Dental anomalies</td>
<td>Brazil</td>
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Table 1. Summary of the 18 case reports of Gardner’s syndrome.

REFERENCES


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