

Phenotypic heterogeneity of impacted third molar tooth: family case study

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Tooth impaction is a pathological condition where a tooth fails to attain its normal functional position. The present study aims to highlight the phenotypic heterogeneity of impacted third molars in a Caucasian family, to investigate the characteristics of the dental phenotype, to evidence the diversity of dental phenotype, and to identify the inheritance mode of the condition. Detailed anamnesis, clinical examination, complementary tests (panoramic radiographs), family study and pedigree analysis. Phenotypic characteristics of impacted third molar tooth in our family case report was: Severe horizontal impaction of the mandibular right third molar, Angular impaction of the maxillary right third molar and angular impaction of the maxillary left third molar, Angular impaction of the mandibular left third molar and partial eruption of the maxillary right third molar, Horizontal impaction of the mandibular left third molar and Angular impaction of the mandibular left third molar. The inheritance mode of the impacted third molar tooth in the family case report was: from mother to both daughters' transmission, from mother to both sons' transmission, and from mother to daughter transmission. Family study and pedigree analysis are very important for illustrate the genetic basis of impacted teeth.

Keywords: Impacted teeth, Third molar, Dental phenotype, Inheritance mode

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Introduction

Tooth impaction is a pathological situation where a tooth fails to attain its normal functional position [1]. Impacted teeth are completely or partially unerupted and are positioned against another tooth, bone or soft tissue [2]. Commonly impacted teeth are: mandibular third molar, maxillary third molar, maxillary canine, mandibular premolar, maxillary premolar, mandibular canine, maxillary central incisor and maxillary lateral incisor [3]. Impacted teeth may remain asymptomatic or may be associated with various pathologies: periodontal bone loss, root resorptions, cysts or tumors and tooth decay [1, 4]. Impaction of the third molar is occurring in up to 73% of young adults in Europe [5, 6]. Most authors claim that the incidence of mandibular third molar impaction is higher in females [6-8].

The etiology of impacted teeth is very diverse and multifactorial. The causes of impaction are local causes of impaction (lack of space due to underdeveloped jaws, lack of a coarse, abrasive diet - an attritive diet - the major cause in modern civilization, chronic inflammation, premature loss of primary teeth or ankylosis of primary or permanent tooth, ectopic position of tooth bud) or systemic causes of impaction, prenatal (heredity and linked disorders, like osteoporosis or cleft palate), postnatal (rickets, anemia, congenital syphilis, tuberculosis, malnutrition, endocrine dysfunction of thyroid, parathyroid or pituitary gland) and rare conditions (cleidocranial dysplasia, oxycephaly, progeria, achondroplasia, cleft palate) [2,3,9,10]. The unerupted and impacted tooth is a common problem and the reason for many orthodontic and pediatric dental referrals, yet the approach to their management is still an area of controversy [11].

Case report

A Caucasian male patient, aged 24, along with his family, present in a private dental practice in Bucharest, Romania, for a routine dental examination. The correct diagnosis of dental impaction requires a detailed anamnesis, clinical examination, and the use of complementary tests to ensure that the correct treatment decisions are made [12]. The clinical examination for all family members was performed in artificial light, using a dental unit, dental mirror and ball-ended probes, after tooth brushing and air-drying, based on the World Health Organization protocol [13, 14].

Digital panoramic radiographs were obtained using a Digital Panoramic X-ray Unit, CRANEX Novus (Manufactured by SOREDEX, Tuusula, Finland), operating at 70 kV.

The panoramic radiographs were evaluated on a computer monitor (21-inch LCD monitor), under dim lighting conditions.

Family study and pedigree analysis were performed to determine the genetic basis of impacted teeth.

Phenotypic characteristics of impacted third molar tooth in our family case report was:

- **Case no. 1:** Mother, II4: severe horizontal impaction of the mandibular right third molar (Figure 1);
- **Case no. 2:** First soon, proband III7: angular impaction of the maxillary right third molar and angular impaction of the maxillary left third molar (Figure 2);
- **Case no. 3:** Second soon, III8: angular impaction of the mandibular left third molar and partial eruption of the maxillary right third molar (Figure 3);
- **Case no. 4:** Mother's sister, II5: horizontal impaction of the mandibular left third molar (Figure 4);
- **Case no. 5:** Daughter, III9: angular impaction of the mandibular left third molar (Figure 5).

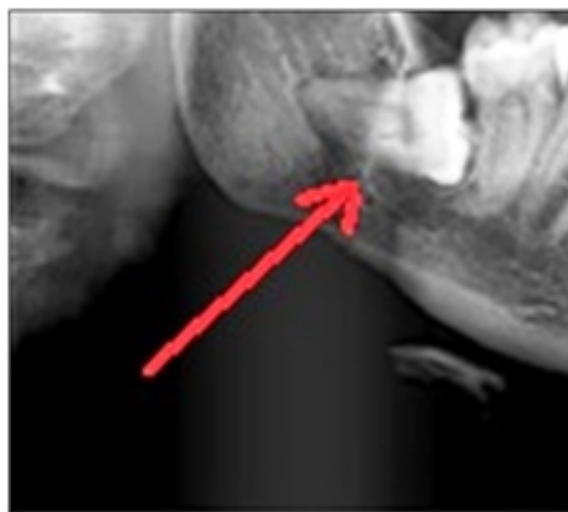


Figure 1 - Case no. 1: Mother, II4: severe horizontal impaction of the mandibular right third molar

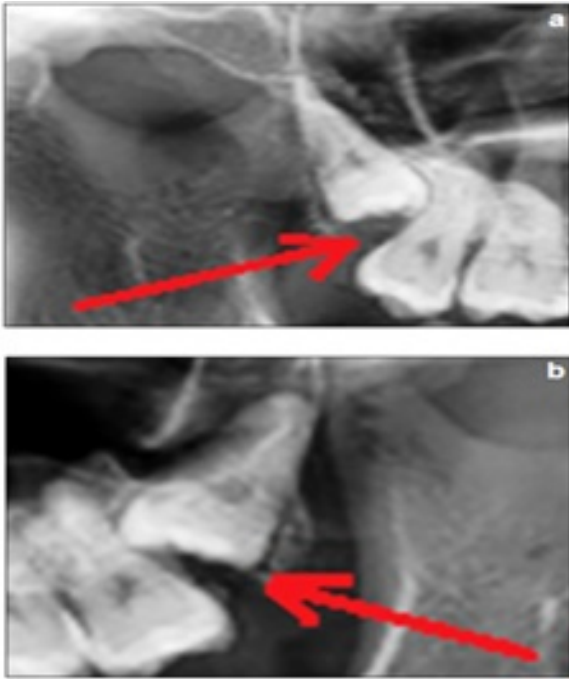


Figure 2 - Case no. 2: First soon, proband III7: angular impaction of the maxillary right third molar (a) and angular impaction of the maxillary left third molar (b).

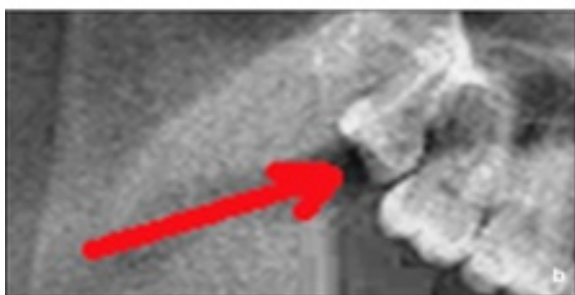


Figure 3 - Case no. 3: Second soon, III8: angular impaction of the mandibular left third molar (a) and partial eruption of the maxillary right third molar (b).



Figure 4 - Case no. 4: Mother's sister, II5: horizontal impaction of the mandibular left third molar

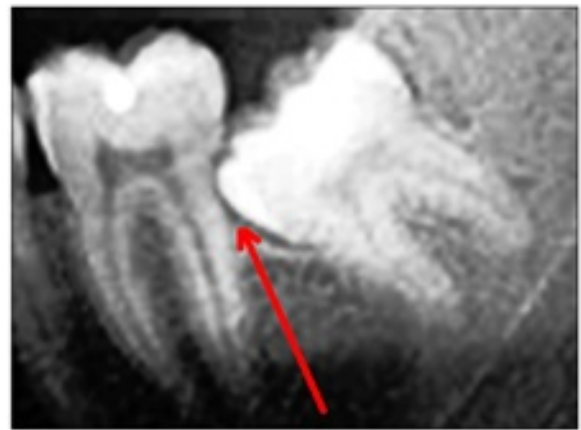


Figure 5 - Case no. 5: Daughter, III9: angular impaction of the mandibular left third molar

The inheritance mode of the impacted third molar tooth in the family case report was: from mother (I1) to both daughters transmission (II4 and II5), from mother (II4) to both sons transmission (III7 and III8), and from mother (II5) to daughter transmission (III9), (Figure 6).

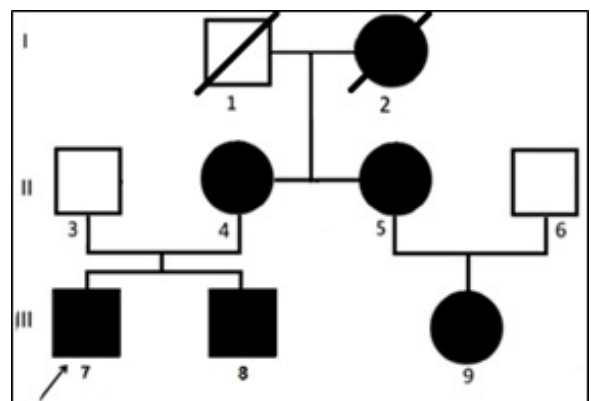


Figure 6 - Family case report: The inheritance mode of the impacted third molar tooth.

The results of the study are summarized in the Table 1.

Table - 1: Family case report.

Family case report			
Phenotypic characteristics	Case no. 1 - II4: severe horizontal impaction of the mandibular right third molar	Case no. 1 - II4: severe horizontal impaction of the mandibular right third molar	Case no. 4 - II5: horizontal impaction of the mandibular left third molar
	Case no. 4 - II5: horizontal impaction of the mandibular left third molar	Case no. 2 - III7: angular impaction of the maxillary right third molar and angular impaction of the maxillary left third molar	Case no. 5 - III9: angular impaction of the mandibular left third molar
		Case no. 3 - III8: angular impaction of the mandibular left third molar and partial eruption of the maxillary right third molar	
The inheritance mode	Mother to both daughters' transmission	Mother to both sons transmission	Mother to daughter transmission

Discussion

Impacted teeth are those with a delayed eruption time or that are not expected to erupt completely based on clinical and radiographic assessment [15].

Impacted third molars are commonly encountered in routine dental practice [1].

The number of people reaching adult life with impacted third molars seems to be increasing to an epidemic extent [16].

Physical barriers (e.g., overretained primary teeth, supernumerary teeth, and pathologic lesions), space problems, dietary changes of modern civilization, developmental abnormalities, altered eruption sequence, trauma, palatal clefts, and genetics can act as etiologic factors of impacted teeth [10, 17].

A precise early diagnosis is essential to evaluate the possible outcomes related to unerupted third molars and to reduce treatment time, complexity, complications and cost [12, 18, 19].

In cases of unerupted or impacted teeth, a multi-disciplinary approach is indicated involving geneticians, orthodontists, paedodontists and oral surgeons to establish the optimal prediction and treatment plan [11].

In the future, additional studies are desired in order to more clearly illustrate the genetic basis of impacted teeth and the long-term effects on occlusal development caused by eruption disturbances of impacted third molar tooth [20].

Conclusion

Family study and pedigree analysis are very important for possible prevention, early diagnosis of the dental phenotype and treatment options for impacted teeth, as well as the timing of any interceptive treatment.

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