

# REVIEWS

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## Maxillary Median Diastema – Review of the Literature

### Diastema pośrodkowa szczęki – przegląd piśmiennictwa

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article

#### Abstract

Diastema in the dental literature is most frequently referred to as space between the central incisors. Observations show that it is not only an aesthetic flaw, but that it can cause periodontal, prosthetic or speech pathology complications. The causes leading to formation of diastema may be various. Based on the available literature, we attempt to analyze the definition of the diastema, to review the nomenclature, typology, and to compare the Polish and English terminology. Based on the literature review, we highlighted many discrepancies regarding the definition and typology of diastema, which as a result leads to significant discrepancies in the interpretation of examination results. Knowledge of the morphological features of the maxillofacial group in conjunction with developmental age allows for the assessment of standards and pathologies of the anterior section of dental arches. The median diastema is usually part of normal bite development during growth and tooth replacement in anterior maxillary arch. When choosing a method of treatment the following factors should be considered: developmental age, degree of irregularity, etiology as well as setting of the incisors, canines, location of a lip frenulum (**Dent. Med. Probl. 2015, 52, 3, 341–344**).

**Key words:** diastema, false diastema, true diastema.

**Słowa kluczowe:** diastema, diastema rzekoma, diastema prawdziwa.

Growth, maturation as well as facial and dental differentiation have been attracting growing interest of researchers for many years now. Maxillary median diastema (MMD) and treatment strategies associated with it have already attracted the attention of Farrea in 1882. Since that time, there can be found discussions in the literature on the etiology of diastema, prevalence, gender differences, time and strategy of treatment as well as genetic and ethnic predispositions. Maxillary median diastema is also a common aesthetic problem, inducing parents to seek orthodontic treatment for their child [1].

The aim of this study is an attempt to analyze the definition of diastema, to review the nomenclature, typology, and to compare the Polish and English terminology based on the available literature.

A review of the literature shows that the term “diastema” is not an unequivocal concept. Masztalerz [2] refers to diastemata in terms of spaces

between all the teeth in the maxillary and mandibular arches that do not impair occlusion but he points out that diastemata is usually defined as the distance between the upper central incisors. Most authors in Polish literature define the term „diastema” as exactly this space, differentiating it in two ways. Taking into account the setting of the long axes of the incisors diastema can be distinguished into divergent, convergent and parallel as well as due to its etiology [2, 3]. Based on causes, Masztalerz [2], Łabiszyńska-Jaruzelska [3] and Karłowska [4] distinguish physiological and pathological diastema. As pathological diastema he classifies a true diastema (*diastema vera*) and false diastema (*diastema spuria*). A different way of differentiation is provided by Orlik-Grzybowska, who believes that true diastemata are those that increase with the growth of dental arches, and the false ones undergo reduction during the development of occlusion [5]. In the English literature,

each space between the teeth is called a diastema. There is also no division of diastema due to their cause and hence Keene [6] defines the term diastema as a space greater than 0.5 mm between the contact surfaces of adjacent teeth, and Stedman's Medical Dictionary defines diastema as a natural space between two succeeding teeth, or an interval between teeth not occurring naturally in man [7]. Kahl-Nieke [8] provides diastema division based on the location in the dental arch, distinguishing diastema within the lateral teeth – diastema laterale, and within the anterior teeth – anteriore diastema. The term diastema mediale defines a specific form of space between the central incisors. Considering the division that can be found in the Polish literature and which is based on direct causes the most common is the physiological diastema.

## Physiological Diastema

Physiological diastemata in the definition provided by Masztalerz and the other authors are considered to be the manifestation of tooth replacement preparation of maxillae [2, 4] (Fig. 1). Studies of the lack of physiological diastema in children and adolescents showed that this symptom may be an expression of inadequate physical development and requires further general diagnostics. According to Śmiech-Słomkowska [in 4] this is also reflected in the insufficiency of body weight and height in children and in dental arches; it may also indicate an insufficient maxillary growth towards the anterior and lateral direction [5] and can lead to irregular settings in the permanent dentition [9, 10].

Diastema located in the maxillary arch between the central incisors is a part of normal bite development during teeth replacement. This period was first described by Broadbent in 1941 during research on dental development. It was named



**Fig. 1.** Bite development – “ugly duckling stage”. Fan-arranged upper incisoras and maxillary median diastema with size of 2 mm

as “ugly duckling stage” [acc. 11]. This stage occurs in substage A phase III according to Hellman, then proceeds to the ongoing eruption of first permanent molars and to the replacement of deciduous incisors by permanent incisors [9]. Besides the physiological diastema incisors are usually fan-arranged – divergently, and because they do not look very aesthetic – this period, therefore, has been named as “ugly duckling stage”. In typically developing bite conditions the median diastema is gradually being closed during the eruption of lateral incisors and permanent canines [2, 11]. Therefore, the incidence of physiological midline diastema at age of 6 years is 98%, then it decreases to 49% at age of 11, at age of 12–18 years incidence of space between the central incisors is 7% [12]. According to Edwards [13] diastema of size not exceeding 2 mm is prone to spontaneous closure without requiring the implementation of the orthodontic appliance therapy. Bennet [14] believes that the treatment may be indicated if the child does not accept the appearance or when in the dental arch there is no space for lateral incisors. Space greater than 2 mm may require surgical intervention within the frenulum tissue [11, 14, 15]. Extreme caution should be taken when planning the closure of the diastema during the phase of bite formation. Unnecessary therapeutic intervention using removable orthodontic appliance can cause root resorption of lateral incisors, and can even stop erupting canines [16]. In some cases it is advisable to use elements of fixed orthodontic appliances in order to move and set parallelly the incisors [16]. Many authors believe that what is difficult is not the treatment for diastema closure, but the prevention of recurrence of this irregularity [11, 17].

## Pathological Diastema

### True Diastema (*Diastema vera*)

The first reports about the possible effects of abnormal attachment of the frenulum of upper lip on the midline diastema formation were published by Angle in 1907 [18]. Most authors agree that low-attached frenulum or its hypertrophy affects the formation of diastema, which is why they call it true diastema [2, 11, 12, 19]. But in the literature there are also studies, which interpret such an attachment of the frenulum of the upper lip as a result of diastema, rather than its cause [20, 21]. Some studies indicate the bone V-shaped gap, which interferes with the formation of intraseptal fibers as a cause of diastema. The gap bone interferes with the formation of intraseptal periodontal fibers, and mechanically prevents the closing of the teeth [22].

Edwards [13] in his studies from 1977 showed that there is a certain percentage of patients who have upper lip frenulum hypertrophy, and there is no diastema or that there is diastema and no evidence of a upper lip frenulum hypertrophy. Also Ceramello [acc. 21] in his research showed no correlation between type of frenulum and the presence of diastema. In the available literature there are given various times of frenulum surgery duration. Some authors are of the opinion that the best results are obtained when the treatment will start after the completion of orthodontic treatment aimed at diastema closure [18], while others are of the opinion that it is better when it is performed during or before treatment. The indications for frenulum surgery with a low attachment can also be complications of periodontal, prosthetic and speech pathology backgrounds [4]. Addy et al. found that only the presence of hypertrophic frenulum of the upper lip has an influence on the increased plaque retention and increase of bleeding rate [19] (Fig. 2).



Fig. 2. *Diastema vera*

### False Diastema (*Diastema spuria*)

False diastema may form due to the insufficiency and/or overproduction of dental lamina in anterior maxillary area [2] (Fig. 3). Then the cause of diastema can be: the lack of tooth bud or lateral incisor tooth buds, hypoplastic lateral incisors, presence of supernumerary tooth or teeth [2, 3]. Among other problems there are mentions of pathological diseases around the median maxilla, which could include odontomas or tumors [17].

### Diastema in Full Permanent Dentition

Numerous epidemiological studies show significant differences in the incidence of midline diastema in adults. Keene [6] gives the incidence of maxillary midline diastema in the full permanent



Fig. 3. Intraoral picture – false diastema

dentition amounting to 14.8% and 1.6% in case of mandible diastema. According to Mitchell [23] maxillary midline diastema incidence in adults amounts from 1.6% to 25.0%, and according to Proffit [11] it is 6.0% in adolescents and adults. The median diastema occurs more frequently in the maxillary than mandibular arch [24], and it may be accompanied by general diastemata [11]. The epidemiological studies show that the highest percentage is observed in Negroid race [23] in comparison to Caucasians and Mongoloid race [17]. Studies of Gass et. al [12] also showed the presence of a genetic predisposition. The capability to inherit maxillary midline diastema was determined as 0.32% in Caucasian race, and 0.04% in Negroid. Analysis of the pedigrees suggests autosomal dominant inheritance, and the greater influence of environmental factors in the Negroid race. The large discrepancy in the incidence of MMD in adults apparently is connected with the ambiguous criteria adopted in the research works, as well as with genetic and/or ethnic predispositions. In many cases, the retained diastema in adulthood becomes the characteristic feature of a person's smile [25]. In contrast to the diastema present in the maxillary arch, the median diastema in the mandibular arch does not constitute a physiological period in the development of a proper bite. In adults, the diastema is generally much more severe and is associated with an unfavorable setting of central incisors (centrifugal and vestibular inclination – distoinclinatio, vestibulotrusio) [1]. Among the causes for diastema we can mention abnormal tongue rest position, combined with its pressure on the dental arch [1].

### Conclusions

The median diastema is usually part of normal bite development during growth and tooth replacement in anterior maxillary arch.

Knowledge of the morphological features of the maxillofacial group in conjunction with developmental age allows the assessment of standards and pathologies of the anterior section of dental arches. The proper diagnosis then can be made which will allow for the application of the appropriate method of treatment – observation of occlusion, orthodontic treatment and/or surgery.

Use of the diastema typology based on its causes facilitates therapeutic decision-making process in clinical work.

When choosing a method of treatment the following factors should be considered: developmental age, degree of irregularity, etiology as well as setting of the incisors, canines, location of a lip frenulum.

There are many discrepancies regarding the definition and typology of diastema in Polish and foreign literature which lead to significant discrepancies in the interpretation of examination results.

The issue area, which includes the incidence of diastema in different populations, may be distorted as a result of the adopted ambiguous evaluation criteria.

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