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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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No 11 (344) 2023

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EVALUATION OF MIDPALATAL SUTURE MATURATION IN THREE AGE GROUPS IN 10-25 YEARS USING CONE-BEAM COMPUTED TOMOGRAPHY

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Abstract.

Introduction: The decision to perform a palatal separation in cases of constricted maxilla has historically relied on the age of the patients. However, there is an increasing amount of literature suggesting that age should not be the only consideration in this decision.

Aims of the Study: The primary objective of this study was to assess the prevalence of various stages of midpalatal suture maturation in age groups of adolescents, post-adolescents, and young adults. In addition, the objectives include the examination of potential correlations between maturation stages and different maxillary measurements.

Materials and Methods: The sample comprised 180 CBCT scans of samples aged 10 to 25 years old consisting of 82 males and 98 females. According to Angelieri's method classification, in the cross-sectional axial slice, the midpalatal suture was categorized into five stages (A, B, C, D, E) based on the level of maturation observed. The samples were categorized into three distinct groups: adolescents, post-adolescents, and young adults. Stages A, B, and C were regarded as open midpalatal sutures, while stages D and E were regarded as partially or completely fused midpalatal sutures. Maxillary measurements were measured in the coronal slices at the level of maxillary first molar including buccal and palatal alveolar crest, palatal depth, palatal index and palatal vault angle.

Results: The most prevalent stage of MPS maturation was C (27.7%), followed by E (21.1%) and D (20.5%). The MPS was not fused in 105 of a total of 180 samples (58.3%) of the overall samples with stages A, B and C). In the males, the most prevalent Stage was D (23.1%); for females, the most prevalent stage was C (32.6%). within the age group 10-15 years. It was possible to determine the open midpalatal suture in (97.8%), but in the age group 16-20 years and 21-25 years the midpalatal suture was found opening in (44.3%) and (43.6%), respectively. Also, the maxillary width and depth were larger in males than in females. **Conclusions:** In a sample of 180, it was shown that the MPS was not united in 105 individuals, (CBCT) plays a crucial role in assessing the potential possibility of palatal disjunction. Positive correlation between stage and palatal depth.

Key words. Midpalatal suture maturation, Adolescent age, Cone-beam computed tomography.

Introduction.

Angell (1860) originally proposed the idea that the maxilla has the potential for expansion by the manipulation of the midpalatal suture [1]. A century later, Haas published the results of a study regarding the fast expansion of the maxillary dental arch through the initiation of midpalatal suture opening [2]. The orthodontic technique employed for solving maxillary transverse deficiencies is commonly referred to as maxillary expansion. The principal objective of this therapeutic intervention is to expand the maxilla by the process of separating the (MPS) [3]. Rapid maxillary expansion (RME) has since become a standard orthodontic treatment for maxillary atresia [4]. A successful opening of the midpalatal suture can be achieved with tooth-borne appliances, only in growing patients where suture fusion has not yet occurred. Along with the increase of MPS maturation, a variable degree of fusion occurs making the procedure less predictable and increasing side effects such as pain, excessive buccal tipping, gingival recession in the posterior segments, ulceration, or necrosis of the palatal mucosa [5-7]. However, there is a greater response at the dentoalveolar level when RME treatment is administered to individuals after the pubertal growth spurt [8]. Because the degree of fusion in the MPS increases with age, chronological age has frequently been used to determine when a conventional or surgically assisted protocol should be performed [9]. Using diagnostic procedures to determine the degree of maturation of the MPS can aid in selecting the best treatment option. Revelo and Fishman proposed in 1994 to evaluate MPS using occlusal radiographs, but the method had a low accuracy due to the superimposition of multiple structures in this 2D diagnostic method [10]. Angelieri et al. (2013) described a method for assessing MPS maturation using Cone Beam Computed Tomography (CBCT). According to the authors, there are five maturational stages (A to E, Figure 1) [11].

Patients in maturational stages A or B are successfully treated with conventional protocols that can still be used in stage C but with a reduced skeletal effect, whereas patients in stages D or E are treated better with SARME [12]. the aims of this study were to evaluate the prevalence of midpalatal suture maturation stages in three age groups 10-15, 16-20 and 21-25 years.

Materials and Methods.

This retrospective study was approved by the Research Ethics Committee of the College of Dentistry / University of Mosul. The sample used in this research included CBCT of 180 patients, 98 female and 82 male, aged 10 to 25 years, retrospectively selected from the dental diagnostic imaging centre of the Al-Shaheed Ghazi Al-Hariri Hospital for Surgical

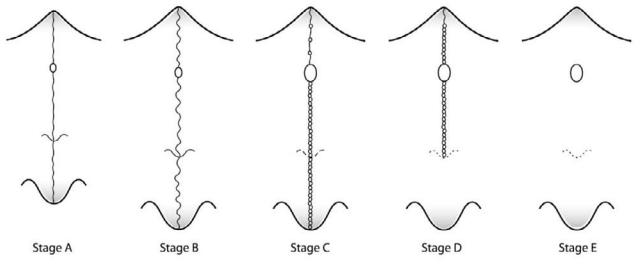

Figure 1. *Schematic drawing of the maturational stages of the midpalatal suture [11].*

Specialties Baghdad, Iraq. All CBCT images evaluated in this investigation were collected using (Kavo op 3d pro CBCT, Germany) with standardization of the head position and the following specifications: 8 × 15 to 13 ×15 cm field of view, 8.7-second Exposure time, 89 kV, and 15 mA. All images processed and evaluated by using the OneDemand3D software viewer (version 1.0; Cybermed, Seoul, South Korea) were used to analyze CBCT images.

Inclusion criteria

1. Patients between 10-25 years old.
2. Good quality CBCT images.

Exclusion criteria

1. Developmental or genetic anomaly related to craniofacial region
2. Cleft lip and palate
3. Poor quality of CBCT images
4. The patient with orthodontic treatment or signs of any appliance at the examination.

The sample used in this research included 180 patients, 98 female and 82 male, aged 10 to 25 years, The samples were divided into 3 groups (Table 1):

Adolescents (10-15)
Post-adolescents (16-20)
Young adults (21-25)

Table 1. *Distribution of the sample.*

Age group	male	female	N.	Percent
(10-15)	26	21	47	26.1
(16-20)	35	43	78	43.3
(21-25)	21	34	55	30.6
total	82	98	180	100

The patient's head was adjusted in the three spatial planes, and the section for assessment of the MPS maturational stages was chosen, the images were obtained in a standardized manner. in the coronal) Figure 2A) and axial views) Figure 2B), the image analysis software cursor was initially positioned at the patient's midsagittal plane. The patient's head was then adjusted in sagittal view) Figure 2C), so that the horizontal reference line coincided with the cancellous bone between the upper and lower cortical bones of the palate, which is the median region of the palate. According to the method of Angelieri et al. [11]. the skeletal maturation stage of the MPS was subsequently visualized and classified in the axial CBCT section. When the patient presented with a broad or thick palate, two axial cross-sectional sections were taken for a more precise evaluation, the most maturation was chosen for this study) Figure 3) [4,11,13].

A curved palate refers to a situation in which the anterior and posterior regions of the palate cannot be observed simultaneously in a single axial slice. In order to determine the sutural staging classification, it is necessary to examine two separate slices. The first slice in which the sagittal plane line passes through the suture in the most posterior region, and a second one with the cursor passing in the most anterior region (Figure 4) was used to evaluate the maturation stage.

Descriptive Stages of Midpalatal Suture Maturation

The evaluation of cone-beam computed tomography (CBCT) images in our study was conducted in a manner according to the methodology employed by Angelieri et al. [11] five maturational stages (A – E, Figure 5)

1. **stage A:** the midpalatal suture exhibits a nearly linear high-density sutural line with minimal or absent interdigitation (Figure 5A) [14-17].
2. **stage B:** the midpalatal suture displays an irregular morphology and appears as a high-density line with scalloped features (Figure 5B). In stage B, patients may exhibit the presence of certain minute regions where two parallel, scalloped, high-density lines in close proximity to each other, and demarcated by small low-density spaces, can be observed [15,16].
3. **stage C:** the midpalatal suture manifests as two adjacent, scalloped, high-density lines in the maxillary and palatine bones. These lines are situated in the areas of reduced density, positioned between the incisive foramen and the palatino-maxillary suture, and also posterior to the palatino-maxillary suture. Two patterns, straight or irregular, can be utilized to arrange the suture (Figure 5C) [11].
4. **stage D:** The process of midpalatal suture fusing has occurred within the palatine bone, with its progression from the posterior to the anterior area indicating maturation (Figure 5D) [18,19].
5. **stage E:** there is evidence of midpalatal suture fusion in the maxillary region. The suture is not obvious in some areas of the maxilla [17,20]. The bone density in this particular region of the palate is similar to that of other regions (Figure 5E) [15,21].

To facilitate the classification of suture maturation, all axial cross-sectional sections were arranged using codes that were shown sequentially on a high-definition computer monitor. The calibration was done twice with a washout period of 4 weeks. Recorded data were submitted to the agreement analysis to check internal examiner errors. 25 images of the midpalatal sutures from the same subjects were selected randomly from the total sample and reclassified by another examiner. Any disagreements were discussed by them to obtain a final decision.

The palatal depth measured in the coronal slices at the level of the maxillary first molar, the coronal plane was perpendicular to the axial plane. The depth was determined from the palatal arch's deepest point to the lingual alveolar crests at the level of the first molar lingual surface (Figure 6).

Statistical analysis

The calculation of weighted kappa coefficients was performed to assess the measurement error across examiners, both intra-examiner and inter-examiner. This analysis was conducted using STATA24 (Statistical Package of Social Science, version 24, Inc. Chicago, USA). The interpretation of the data followed the scale established by Landis and Koch.

Results.

The kappa coefficients for the evaluation of intra-examiner agreement for the MPS maturation stage were (0.860). The inter-examiner reliability analysis also showed almost perfect agreement for the MPS maturation stage, with kappa coefficients of (0.843).

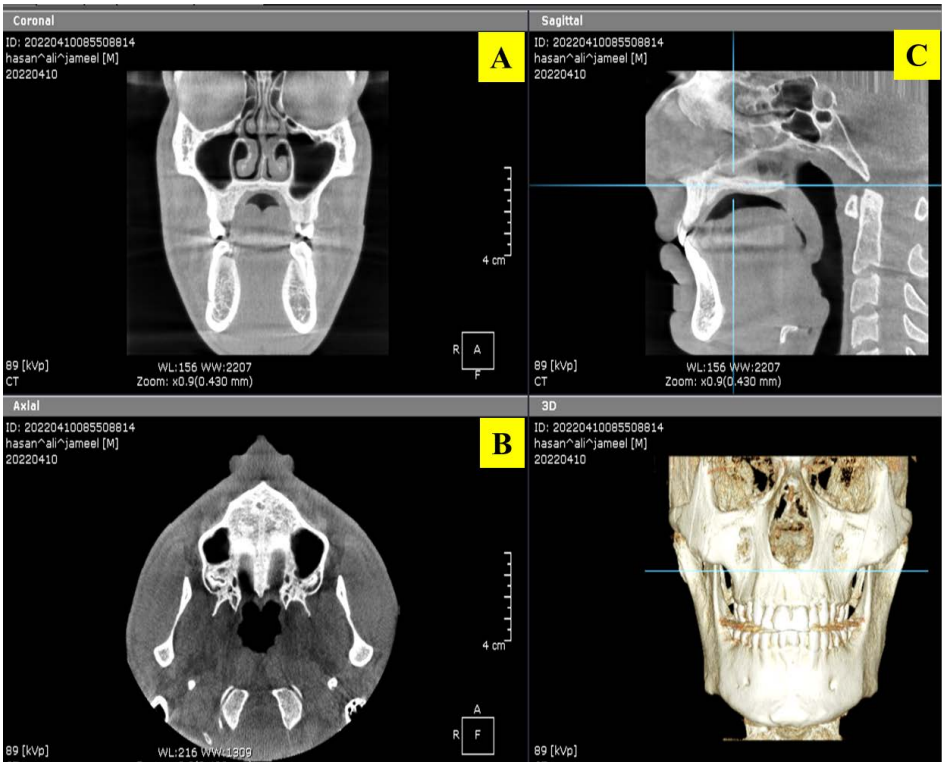

Figure 2. *Standardization of head position in the coronal, axial, and sagittal lines (A, B, and C). The midpalatal suture can be measured the same way every time. in C, the sagittal view, the line that shows where the axial plane view is in the middle of the hard palate's superior-inferior dimension.*

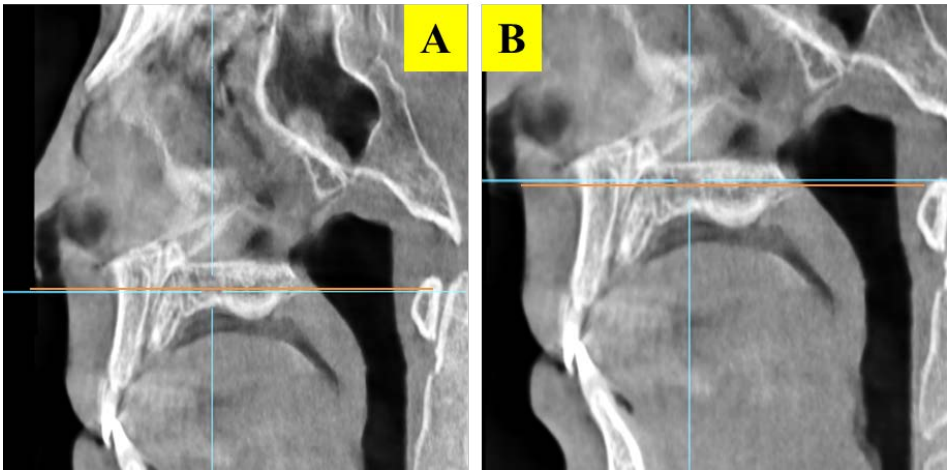

Figure 3. *For patients with a thick palate, the two axial slices in the middle were analyzed (orange line).*

Table 2. *Distribution of the midpalatal suture maturational stages by age and gender.*

Age (year)	Gender	A		B		C		D		E		total
		N	%	N	%	N	%	N	%	N	%	
10–15	M	16	61.5	7	26.9	3	11.5	0	0	0	0	26
	F	5	23.8	7	33.3	8	38	0	0	1	4.7	21
	M+F	21	44.6	14	29.7	11	23.4	0	0	1	2.1	47
16-20	M	0	0	5	14.2	8	22.8	11	31.4	11	31.4	35
	F	2	4.6	5	11.6	15	34.8	11	25.5	10	23.2	43
	M+F	2	2.5	10	12.8	23	29.4	22	28.2	21	26.9	78
21-25	M	0	0	2	9.5	7	33.3	8	38	4	19	21
	F	1	2.9	5	14.7	9	26.4	7	20.5	12	35.2	34
	M+F	1	1.8	7	12.7	16	29	15	27.2	16	29.	55
total		24	13.3	31	17.2	50	27.7	37	20.5	38	21.1	180

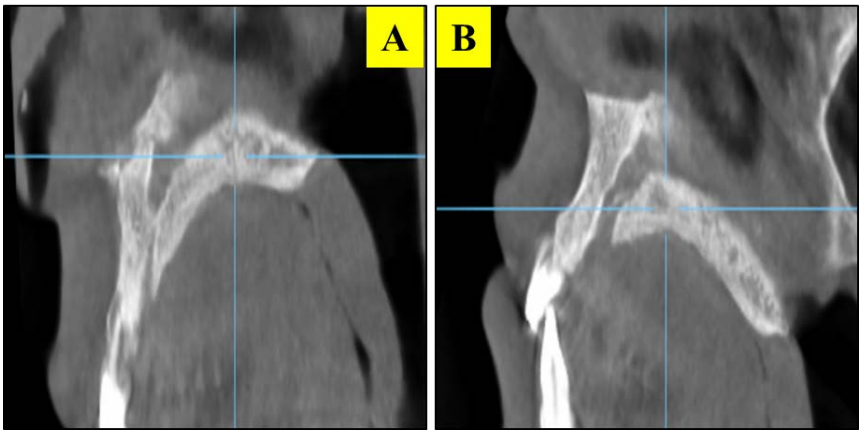

Figure 4. *For patients with a curved palate, two sagittal sections were used: one for the anterior (A) and one for the posterior (B). The two images were used to determine the sutural stage.*

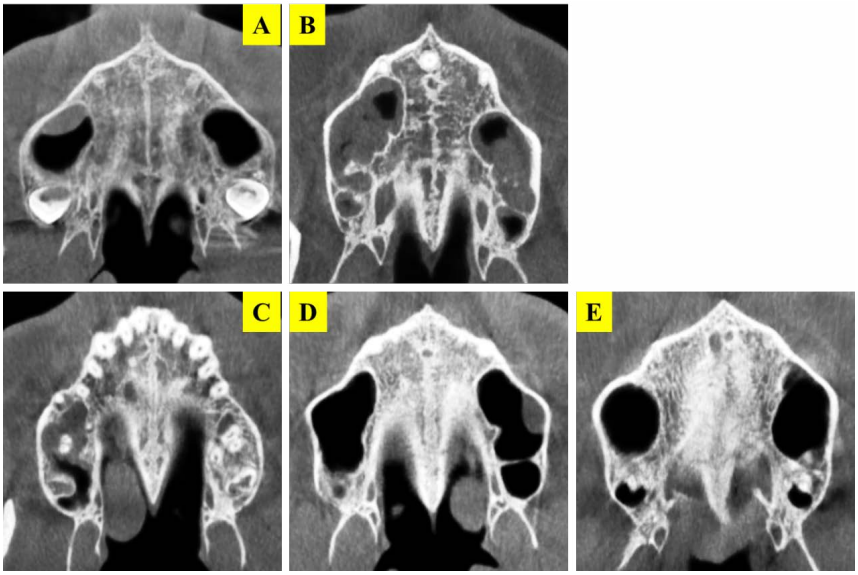

Figure 5. *A, This patient exhibits Stage A maturation of the midpalatal suture as a relatively straight, dense midline line. B, Stage B is characterized by a single scalloped, high-density midline line. C, Stage C appear as two parallel, scalloped, high-density lines that are near together and, in some areas, separated by small low-density spaces. D, Stage D is represented by two high-density, scalloped lines that run down the midline of the palate's maxillary region. E, Sutural fusion has taken place in the maxilla at stage E.*

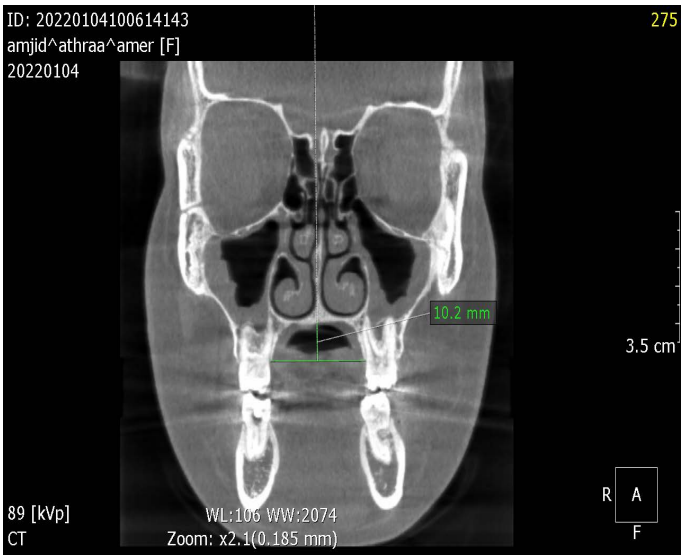

Figure 6. *The palate height (Depth).*

Regarding the distribution of the sample, (45.5%) were male, while 54.5 were female. Table (2) displays the distribution of the maturational stages observed in the midpalatal suture within the sample.

The most frequent maturation stage in the study population was stage C (27.7%), followed by stages E (21.1%), D (20.5%), B (17.2%), and A (13.3%). The MPS was not fused in 105 out of 180 subjects (58.3% of the total sample with stages A, B and C). In the females, there was a higher prevalence of stage C (32.6%) and stage E (23.4%), while in males stage D and C were the most prevalent stages (23.1%) and (21.9%) respectively. stage C was the most prevalent stage in the age group 16-20 years (29.4%). Stage A was noted high prevalence in the adolescent group from 10-15 age (44.6%), which appeared higher in males (61.5%) than females (23.8%). only one subject presented with fused suture in this age group (one female). Also, Stage B was present mainly in the adolescent group from 10-15 (29.7%). In the group between 21-25 years (1) subject was observed in stage A and 7 subject was observed in stage B. When all groups are considered, we observed that in the age group of 10-15 years is possible to verify open midpalatal suture in 97.8%. in the age group of 16-20 years and 21-25 years, it is possible to verify a MPS opening in 44.8% and 43.6%, respectively.

Table 3. *Distribution and comparison of the MPS maturational stages in 10–25-year-old subjects by gender.*

gender	Stage										Total
	A		B		C		D		E		
	N	%	N	%	N	%	N	%	N	%	
male	16	19.5	14	17.07	18	21.9	19	23.1	15	18.2	**82**
female	8	8.1	17	17.3	32	32.6	18	18.3	23	23.4	98

Table 4. *Statistical description of palatal depth in relation to the degree of suture maturation.*

	DEPTH	
Stage	**mean**	**S.D**
A	10.658 D	2.181
B	11.898 C	2.619
C	12.310 BC	2.030
D	13.318 AB	2.330
E	13.531 A	2.442
T-value	7.485	
sig.	0.0001	

Table 5. *correlation between stage, age, and depth.*

	Age	DEPTH
Stage	0.510**	0.372**
*Correlation is significant at the 0.05 level. **Correlation is significant at the 0.01 level.		

Table (4) shows the Descriptive statistics for depth in stages A, B, C, D, and E. Regarding the significance between stages and depth there is a highly significant difference between the stages and the depth. There is a high positive correlation between Age and stage, also There is a high positive correlation between Age and depth of the palate (Table 5).

Discussion.

The management of transverse maxillary constriction in individuals is a significant subject matter for orthodontic professionals, particularly when dealing with post-adolescence and young adult patients [12]. Despite the clear efficacy of the (RME) protocol in clinical applications, limited consensus has yet to be reached about the age limit for traditional palatal expansion techniques. The primary reason for this issue might be attributed to the significant physiological variability observed among patients with regard to the timing and extent of palatal suture closure. Consequently, accurately diagnosing this condition becomes challenging [18,19,22-24]. The more extensive the fusion of the MPS, the more pronounced the reduction in skeletal consequences and the more significant effect on the dentoalveolar area resulting from this treatment [4,25]. The presence of uncertainty creates states of undesirable effects. Despite being a conservative treatment, (RME) can have adverse effects when used in individuals exhibiting complete or partial closure of the midpalatal sutures. These consequences may include notable observed symptoms that include pain, gingival recession, ulceration or necrosis of the palatal mucosa, buccal tilting of the posterior teeth, and decreased thickness of the buccal bone [6,26-30], bending of the alveolar bone [31], resorption of buccal roots [32], fenestration of the buccal cortex [33], and instability of the expansion [34,35]. However, it is essential to acknowledge that a surgical expansion using SARPE can be conducted at any time in an individual's life. It is associated with elevated morbidity, expense, danger, and a prolonged recovery period for the patient [25]. Stage D was detected most commonly in males, while in females stage C was detected the most. Stage A was found mainly in the age group 10-15. It was anticipated that this particular stage would have a higher prevalence among individuals of younger age groups. It is worth mentioning that seven out of the total number of patients who are classified within the age range of 21-25 years are in stage B. In contrast, the incidence rates of stages A and B among individuals aged 18 and above were slightly higher compared to the findings reported by Ladewig et al. [13]. 2.5% and 3.1% according to Angelieri et al. [11] findings. It is known that stage C is a transitional period as reported by Tonello et al. [4] achieving successful maxillary expansion remains effective in this stage. Both Tonello et al. [4] and Ladewig et al. [13], suggested that the most common stage was Stage C (44.6% and 50%), respectively. This stage was also noted in the current study most frequently, especially in the age group 16-20 years, which was more present in females than males. Stage D and E were the less in the age group 10 -15 years old. The observed outcome was anticipated, as these stages indicate the initiation or completion of the ossification process of the suture in which RME can be done successfully in this age group. In the age group of 21-25 years old patients, a high rate of the sample still had either full or partial MPS opening. Villarroel et al. [36] and Shayani et al. [25] findings, were 39.2% and 38.8%, respectively, in the same age group. This is crucial as conventional maxillary expansion can still be accomplished. It is crucial to note that although the mid-palatal suture remains unclosed in such individuals, other cranial structures may exhibit limitations to palatal expansion. In reality, there are additional circunmaxillary sutures [37]. The zygomatic arch and sphenoid bone are also implicated in this process [32,38]. Therefore, for enhanced prognostic accuracy, future research should

incorporate these structures into its evaluation. In the past, the clinical decision between conventional RME and SARME was often based on chronological age. However, it has been demonstrated in the literature that relying just on chronological age cannot be a dependable method for assessing the maturation state of MPS [12,39,40,41]. The present study provides support for this concept, suggesting a potential paradigm change in the approach to treating maxillary constriction. According to this study, the possibility of discovering a midpalatal suture opening is the same for both genders female (58.1), and male (58.5%). The younger age group (10-15) exhibited a greater incidence of stages A, B, and C, and decreased in the older age (16-20) and (21-25) respectively. stage D and E were identified in the age group 16-20 years was close to the ratio in the study of Ladewig et al. [13], where (47.82%) of the subjects in the age group 16-20 years of age were in stages D and E of sutural maturation. In the study of Jiménez-Valdivia et al [12] (78.8%) of the subjects were diagnosed in stages D and E. The result exceeded the findings in this research and that of the Ladewig et al study. Our finding in the age group 16-20 was close to Ladewig et al. [13] where (52.6%) of the sample had an open suture (stages A, B, and C). This shows that disjunction could be successful even in older age groups without referring the patient for surgery, while in the study of Jiménez-Valdivia et al. [12], (21.1%) of the sample presented with open suture in the same age group. Stage show a high correlation with depth, as the stage increase according to age, also Depth increases with age, this may give an indicator that as the depth increase the maturational stage increase providing a chance for application in dental diseases [42].

Conclusion.

The midpalatal suture (MPS) maturation method emerges as a promising diagnostic tool, particularly in the assessment of palatal disjunction in individuals beyond adolescence and young adulthood. With the aid of cone-beam computed tomography (CBCT), the potential for utilizing MPS maturation as a diagnostic marker becomes even more evident. The findings from the study indicate that a significant proportion of the sample population displayed non-fused MPS, highlighting the relevance and prevalence of this phenomenon. Furthermore, the positive correlation observed between the maturation stage and both maxillary depth and age further supports the validity and utility of the MPS maturation method as a diagnostic tool. These findings not only contribute to our understanding of palatal development but also have potential implications for clinical practice, allowing for more accurate and informed assessments of palatal disjunction and related conditions. As research in this field continues to evolve, the MPS maturation method holds promise as a valuable tool for clinicians in their diagnostic endeavours.

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