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Rasprostranjenost i svojstva impaktiranih drugih mandibularnih molara kod kinesko-američke školske djece

Prevalence and Characteristic Features of Mandibular Second Molar Impaction in Chinese-American School Children

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Sažetak

Svrha: Željeli su se odrediti rasprostranjenost i svojstva zaglavljenja (impakcije) drugoga donjočeljusnog kutnjaka (mandibularnog molara) u velikom etničkom uzorku kinesko-američkih ortodontskih pacijenata. **Materijali i metode:** Analizirano je tri tisuće ortopantomograma kinesko-američke djece podvrgnute ortodontskoj terapiji. Pozornost je bila usmjerena na impakciju drugoga mandibularnog molara, njegov anatomski položaj i nagib u odnosu na susjedne zube. Sve su te vrijednosti zabilježene. **Rezultati:** Uočene su 103 jednostrane i obostrane (unilateralne i bilateralne) impakcije drugoga kutnjaka u donjoj čeljusti kod 71-og kinesko-američkog pacijenta, pa je učestalost iznosila 2,36 posto. Gotovo svi zubi (89%) bili su nagnuti mezijalno. Uglavnom su zabilježeni zaglavljeni zubi u posteriornom mandibularnom dijelu, a nerazvijeni treći molari locirani su u području korijena drugih molara. To je na dvodimenzionalnom ortopantomogramu ostavljalo dojam preklapanja. **Zaključak:** U slučaju kinesko-američkih ortodontskih pacijenata zabilježena je impakcija drugih mandibularnih molara od 2,36 posto. Većina tih zuba bila je nagnuta mezijalno u posteriorno zbijenom području pokraj trećeg kutnjaka u razvoju. Mogući krivac za zaglavljenost jest dominantni mezijalni nagib, vjerojatno uzrokovan različitom brzinom razvoja korijena (distalni korijen je razvijeniji od mezijalnog). Preuzak posteriorni prostor nije toliko važan te se smatra sekundarnim uzrokom. Kako bi se postigao najbolji mogući klinički ishod, preporučuje se rano otkrivanje i odgovarajuća ortodontska terapija.

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Uvod

Trajna zaglavljenost zuba čest je klinički problem jer može zahvatiti bilo koji zub. Definira se kao primarna nemogućnost erupcije. Unatoč tome izraz se rabi i za zube kod kojih je erupcija zaustavljena zbog prepreka u nicanju, kao što je, primjerice, prekobrojni zub ili odontom, preuzak prostor i abnormalni nagib. Najčešće su zahvaćeni mandibularni i maksilarni treći molari, maksilarni kanini i središnji incizivi te mandibularni drugi premolari (1). Impakcija drugih mandibularnih molara (MM 2) vrlo je rijetka – tako od nje pati 0,06 posto novaka američke vojske (1), 0,3 posto ostalih mladih Amerikanaca (2), od 0,58 do 1 posto kineske školske

Introduction

Permanent tooth impaction is a common clinical problem that may involve any tooth in the human dentition. A tooth impaction is defined as a primary failure of eruption. However, the term is also used when its eruption is arrested due to an obstacle such as a supernumerary tooth or an odontoma, lack of space or an abnormal angulation of the tooth in its eruption path. It usually occurs to the mandibular and maxillary third molars, the maxillary canines or central incisors and mandibular second premolars (1). Impaction of the mandibular permanent second molars (MM2) are rather rare and their prevalence studied by panoramic radio-

djece u Hong Kongu (3,4) te od 1,8 do 3 posto ortodontskih pacijenata (5,6).

Etiologija impakcije drugih molara može biti povezana s nasljeđem, sistemskim bolestima, poremećajima u nicanju zbog prerane ekstrakcije prvog molara, posteriornim manjkom prostora, nepravilnom mezijalnom nagnutošću zuba u fazi nicanja te nepovoljnim položajem trećeg kutnjaka u razvoju ako naliježe na drugi molar (5, 7).

Kao još jedan uzrok za zaglavljenost MM2 navodi se nedovoljno dug zubni luk u stražnjem segmentu mandibule, a ponekad i u prednjem (2,5). Zato korištenje tzv. *lip bumpera* za korekciju zbijenosti u prednjem segmentu, uz distalizaciju prvog molara, može rezultirati impakcijom MM2. No, za razliku od radova u kojima se ističe uska povezanost između duljine luka i impakcije MM2 (8), u drugima se navodi da više prostora između prvoga mandibularnog molara (MM1) i MM2 u razvoju potiče njegovo mezijalno naginjanje, što na kraju završava zaglavljenošću (9).

Zubni zametak drugoga mandibularnog molara razvija se s mezijalnim nagibom te je lociran na prednjem rubu ramusa mandibule. Resorpcija kosti, remodeliranje mandibularnog ramusa te mezijalna migracija prvog molara, uz iskorištavanje Leewayjeva prostora, obično ostave dovoljno mjesta za nicanje drugog molara. Nedovoljan rast mandibule, preslaba resorpcija i remodeliranje na prednjem dijelu ramusa mogu rezultirati nedovoljnom duljinom zubnog luka, zbijenošću u stražnjem dijelu čeljusti i impakcijom (10).

Zaglavljeni drugi kutnjak češće se unilateralno pojavljuje kod muškaraca i uglavnom izrasta na desnoj, a ne na lijevoj strani (5). Inače, impaktirani zubi mogu biti postavljeni mezijalno, distalno (slika 1A) i vertikalno (slika 1B). Najčešće su mezijalno nagnuti (5, 11).

Impaktirani drugi mandibularni molar najčešće se otkriva na ortopantomogramu tijekom rutinskog pregleda i rijetko je glavni razlog za ortodontsku terapiju. No, ako se takvo stanje ne liječi, mogu nastati ozbiljni klinički problemi, kao što su resorpcija korijena prvog molara (slika 2.) (12), karijes i parodontni džepovi na prvom i drugom kutnjaku, folikularna cista (slika 3.) i perikoronitis (13).

Svrha ovog istraživanja bila je odrediti rasprostranjenost i svojstva impakcije drugoga mandibularnog molara u velikom, etnički specifičnom uzorku kinesko-američkih ortodontskih pacijenata.

Materijali i metode

Za istraživanje je poslužilo tri tisuće ortopantomograma pacijenata koji su bili podvrgnuti ortodonstkoj terapiji u jednoj privatnoj klinici u China townu u New Yorku. Odabrani su oni na kojima je bila uočena približno ista mezijalno distalna širina prvog molara. Svi ortopantomogrami učinjeni su prije početka terapije. Dob pacijenata bila je između 11 i

graphs has been reported to be 0.06% in American army recruits (1), 0.3% in young US individuals (2), 0.58% - 1% in ethnic Hong Kong Chinese school children (3,4), and 1.8% to 3% of orthodontic patients (5,6).

The etiology of second molar impaction can be related to heredity, systemic diseases or local eruption disturbances due to an early extraction of the adjacent first molar, posterior crowding, abnormal mesial angulation of the erupting second molar, and the unfavorable position of the developing third molar on top of the second molar (5,7).

It has been suggested that arch length deficiency in the posterior or even in the anterior segments of the mandibular arch might be the main factors for MM2 impaction (2, 5). Therefore, using the lip bumper to correct anterior crowding by distalization of the mandibular first molar might result in MM2 impaction.

However, unlike reports suggesting a close association between arch length deficiency and MM2 impaction (8), it has been reported that excess space between the mandibular first molar (MM1) and the developing MM2 might allow for a more mesial inclination of MM2 resulting in its impaction (9).

The tooth bud of the mandibular second molar develops with some mesial angulation, located at the anterior border of the ramus. Bone resorption and remodeling at the mandibular ramus and mesial migration of the first molar, utilizing the Leeway space, usually provide enough space for the eruption of the second molar. The inadequate mandibular growth or remodeling resorption at the anterior border of the ramus may lead to arch length deficiency, posterior crowding and impaction (10).

Mandibular second molar impaction develops more frequently unilaterally, is found more often in males and was reported to be present more often on the right than on the left side (5). They may be impacted in three forms of angulations: mesially or distally inclined (Fig. 1A) and vertically positioned (Fig. 1B). Most commonly, they are found in significantly mesial angulation (5, 11).

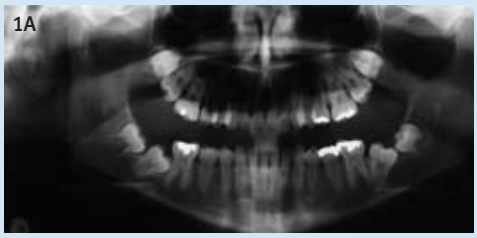
Mandibular second molar impaction is usually detected in routine panoramic radiographs during orthodontic treatment and is rarely the main reason for referral to the orthodontist. If not treated, it may cause serious clinical problems such as external root resorption of the first molar (Fig. 2) (12), caries and periodontal pockets involving the first and second molars, follicular cysts (Fig. 3) and pericoronal inflammation (13).

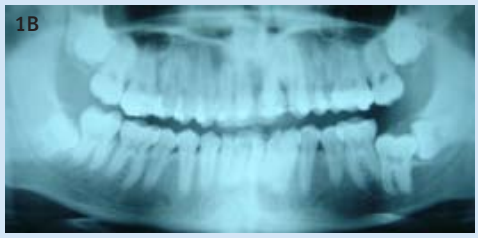
The aim of the present study was to determine the prevalence and characteristic features of mandibular permanent second molar impaction in a large sample of ethnic Chinese-American orthodontic patients.

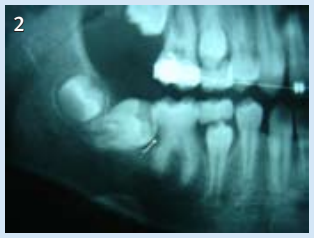
Material and methods

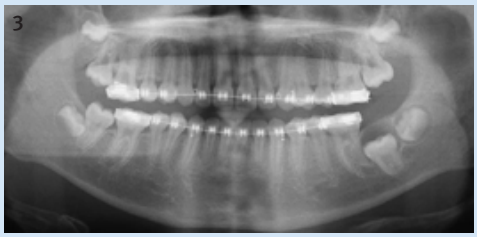
The material for this study consisted of selected panoramic radiographs of

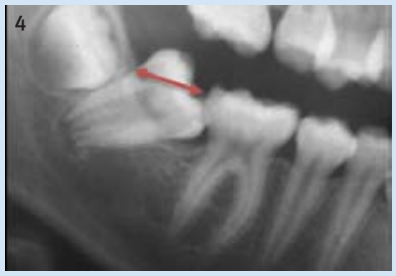
3000 consecutively treated patients, all from a Chinese-American origin collected at a private orthodontic practice in China town, New York City. Only radiographs with similar right/left mesiodistal crown size of the first molars were se-

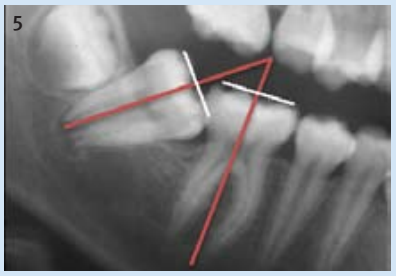


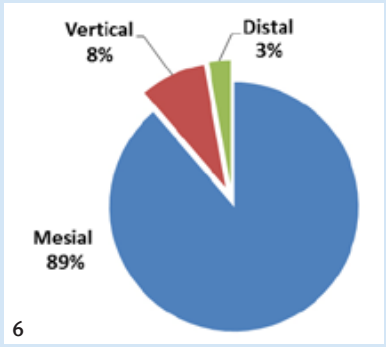


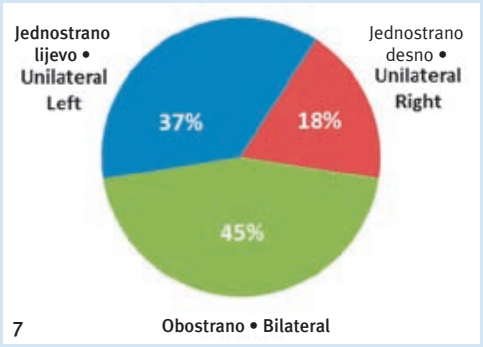












Slika 1. A. Desni impaktirani MM2 nagnut mezijalno. Lijevi impaktirani MM2 nagnut distalno. B. Lijevi MM2 vertikalno impaktiran
Figure 1 A. Right impacted MM2 mesially angulated. Left impacted MM2 distally angulated. B. Left MM2 vertically impacted.
Slika 2. Eksterna distalna resorpcija korijena prvog molara uzrokovana pritiskom mezijalno impaktiranog MM2 (strelica)
Figure 2 External distal root resorption of the right first molar caused by pressure of the mesially impacted MM2 (arrow).
Slika 3. Folikularna cista iznad MM2 na lijevoj strani čeljusti uzrok je zaglavljenosti
Figure 3 A follicular cyst on top of left MM2 causing its impaction.
Slika 4. Udaljenost između prvog molara i prednjeg ruba ramusa
Figure 4 The distance between the first molar and the anterior border of the ramus.
Slika 5. Kut između prvog mandibularnog molara i mezijalno nagnutog drugog molara
Figure 5 Angle between the mandibular first molar and the mesially inclined second molar.
Slika 6. MM2 – nagib
Figure 6 MM2 angulation.
Slika 7. Strana impakcije MM2
Figure 7 Side of MM2 impaction.

15 godina, s prosjekom od 13,3 godine. Svi su bili uključeni u ranije istraživanje o drugom impaktiranom mandibularnom molaru (6).

Svi ortopantomogrami skenirani su uređajem UMAX s rezolucijom od 300 dpi (PowerLook – 1000, Dallas, Teksas, SAD) i pohranjeni u računalo. Tako digitalno spremljeni mjereni su pikselima kao mjerim jedinicama u programu Java (Image-J 1,34s, NIH; Bethseda, Maryland, SAD). Kako se između ortopana može razlikovati povećanje, usporedba za svakog pacijenta napravljena je kontralateralnim mjerenjem (14).

Sva je mjerenja isti mjerač obavio dva puta (T.F.) i izračunao je prosjek. Pikseli su pretvoreni u milimetre koristeći se izračunatom kalibracijom kod koje je 1 mm = 7,874 piksela. Tako sva mjerenja u ovom istraživanju predstavljaju stvarne mjere u milimetrima. Razlike su statistički analizirane testom *Chi-square,* a za statistički značajnu vrijednost uzet je $p<0,05$.

lected for the study. All the radiographs were taken prior to orthodontic treatment. Age group of the patients was 11-15 years with mean age of 13.13 years. These patients were included in an earlier study on mandibular second molar impaction (6).

The panoramic radiographs were scanned into the computer with a 300 dpi resolution using UMAX scanner (PowerLook- 1000, Dallas, Texas, USA). The digitized images were measured in pixels using Java image processing program (Image-J 1.34s, NIH, Bethesda, Maryland, USA). Since enlargement can differ between panoramic radiographs comparison was made between contra-lateral paired measurements in the same patient (14).

All measurements were taken by the same examiner (T.F) twice and an average value was calculated. The pixels were then converted to millimeters according to a calculated calibration where 1mm= 7.874 pixels. Thus, the measurements reported in this study represent the actual sizes in millime-

Udaljenost od distalne konture MM1 do ramusa izmjerena je u milimetrima, paralelno s okluzalnom plohom (slika 4.). Kut naginjanja impaktiranog MM2 izmjeren je povlačenjem linije kroz sredinu krune i korijena te povlačenjem druge linije okomite na tangentu koja povezuje vrh mezijalne i distalne kvržice (okluzalna ravnina). Slične linije povučene su i na prvom kutnjaku (slika 5.).

Impakcija MM2 definirana je prema sljedećim kriterijima:

1. potpuno nicanje MM2 na jednoj strani, dok na kontralateralnoj strani zub nije niknuo iako je formirano više od tri četvrtine jednog korijena;
2. drugi molar je toliko nagnut da je njegova mezijalna kvržica u bliskom doticaju s cervikalnom konstrikcijom (zbijenošću) prvog molara; prema tom kriteriju mjereni su samo mezijalno nagnuti MM2.
3. svi su pacijenti kinesko-američkoga podrijetla.

Rezultati

Proučeno je tri tisuće ortopantomograma ortodontski tretiranih kinesko-američkih pacijenata. Kod 71-og pronađena su 103 impaktirana druga donjočeljusna kutnjaka, što iznosi 2,36 posto. U odnosu *dječaci – djevojčice* to je 41 dječak (58%), pa rasprostranjenost iznosi 1,36 posto, i 30 djevojčica (42%) – u tom je slučaju rasprostranjenost 1,0 posto (tablica 1.). Mezijalni nagib uočen je kod 89 posto pacijenata, njih osam posto imali su vertikalno impaktirane zube, a samo kod tri posto bili su distalno nagnuti (slika 6.). Kut nagiba mezijalno impaktiranih MM2 iznosio je od 30 do 70 stupnjeva. Jednostrana impakcija uočena je u 39 slučajeva (55%) – 26 samo na lijevoj (37%) i 13 (18%) na desnoj strani, a 32 (45%) pacijenta imala su obostrano zaglavljenje (slika 7.). Udaljenost između distalne konture MM1 i prednjeg ruba ramusa bila je značajno manja (p<0,001) na strani impakcije negoli na drugoj strani čeljusti.

ters. Differences were analyzed statistically using the Chi-square test and were considered statistically and clinically significant at the p<0.05 level.

The distance from the distal height of contour of the MM1 to the ramus was measured in millimeters, parallel to the occlusal plane (Fig. 4).

The angulation of the impacted MM2 was measured by drawing a line through the middle of its crown and roots and a line perpendicular to the tangent of a line drawn from the tip of the mesial cusp to the tip of the distal cusp (the occlusal plane). Similar lines were drawn on the first molar (Fig. 5).

MM2 impaction was defined according to the following criteria:

1. Complete eruption of the MM2 on one side, while the contra-lateral MM2 had not emerged, even though more than three quarters of one root were formed.
2. The second molar was so angulated that its mesial cusps were locked in tight contact under the distal undercut of the first molar. According to this criterion, only mesial angulated MM2s were measured.
3. All patients were of ethnic Chinese-American origin.

Results

Panoramic radiographs of 3,000 orthodontically treated Chinese-American children were studied. In 71 individuals a total of 103 impacted mandibular second molars were detected, presenting a prevalence rate of 2.36%.

Male / female distribution was 41 (58%) with a prevalence of 1.36%, and 30 (42%) with a prevalence of 1.0%, respectively (Table 1). Mesial angulation was detected in 89% of the patients, 8% were vertically impacted and only 3% had distal inclination (Fig. 6). The angle of mesially impacted MM2s ranged between 30 to 70 degrees.

Unilateral impactions were presented in 39 (55%) of the cases, 26 (37%) on the left and 13 (18%) on the right side, while 32(45%) had bilateral impactions (Fig. 7).

The distance from the distal height of contour of the MM1 to the anterior border of the ramus was significantly smaller (p<0.001) in the impacted side compared with the non-impacted side.

Tablica 1. Distribucija prema spolovima među pacijentima s impaktiranim MM2
Table 1 Gender distribution of patients with impacted MM2.

	Broj • Number	Postotak • Percentage %
Muški • Male	41	58
Ženski • Female	30	42
Ukupno • Total	71	100

Rasprava

Rasprostranjenost impakcije MM2 kod kinesko-američkih ortodontskih pacijenata iznosila je 2,36 posto, što je znatno više od 0,06 do 0,3 posto koliko je zabilježeno za bijelu populaciju (1,2) te dva puta više od jedan posto uočen kod kineske školske djece u Hong Kongu (4). To je slično rezultatima dobivenima za švedsku populaciju (15). Naši rezultati

Discussion

The prevalence of MM2 impaction found in ethnic Chinese-American orthodontic children was 2.36%, much higher than the 0.06% - 0.3% reported for white Caucasian population (1,2), and more than two-fold greater than the 1% in the Hong Kong Chinese school children (4), but similar to the findings of a Swedish population (15). Our findings cor-

potvrđuju podatke iz istraživanja dobivene za kinesku djecu u Singapuru kod kojih je uočeno dva do tri puta više impaktiranih MM3 negoli kod bijele djece (16).

Zaglavljenost zuba i nedovoljno duga donja čeljust u posteriornom dijelu smatraju se dvama najčešćim uzrocima impakcije MM2 (2,5,7). Liječnica Evans je tijekom desetogodišnjeg istraživanja zabilježila znatan porast impakcije MM2 u Bristolu u Velikoj Britaniji. Autorica je to objasnila promjenama u načinu ekstrakcija MM1 koji su mnogo veći i promjenama u ekstrakcijama premolara koji su manji. To je sve na kraju rezultiralo s premalo prostora za MM2 i posljedičnom impakcijom (7). Uz navedene zaključke, autorica je pronašla i povezanost između unilateralne zbijenosti MM2 i pomaka medijalne linije mandibule prema strani impakcije, što rezultira premalom duljinom čeljusti na toj strani (7).

O zaglavljenosti u posteriornom segmentu koja rezultira impakcijom MM2 govorio je i Buchner (17). Istaknuo je da Kinezi imaju veće zube od bijelaca (18), te kako ta činjenica može djelomice objasniti veću rasprostranjenost impakcije MM2 kod pripadnika toga naroda. Pretpostavlja se da genetski čimbenici, čiji je zadatak nadzor razvoja zuba, kontroliraju i njihovu veličinu (19). U našem uzorku udaljenost između MM1 i prednjeg ruba ramusa mandibule, odnosno mjesta gdje se MM2 razvija i izbija, bila je značajno smanjena (p<0,001) na impaktiranoj strani u usporedbi s neimpaktiranom, što sugerira da u donjoj čeljusti nema dovoljno mjesta za drugi kutnjak.

MM2 i drugi premolari niču istodobno te se doslovce natječu za mjesto u zubnom luku. To može rezultirati skraćivanjem prostora u čeljusti i posteriornom zbijenošću te uzrokovati impakciju drugog molara u slučaju da drugi premolar izbija prije njega. Osim toga i treći se molar može natjecati za prostor iza drugog molara ili iznad njega.

Unatoč istraživanjima u kojima se ističe da je uzrok zaglavljenosti MM2 posljedica premalo mjesta u čeljusti, postoji i mogućnost da višak prostora u području molara uzrokuje naginjanje MM2, a rezultat je impakcija (9). Poznata je činjenica da distalni korijen prvog molara služi kao vodilja za normalnu erupciju drugog molara, te da drugi maksilarni sjekutići pomažu svojim distalnim plohama korijenu pri normalnoj erupciji maksilarnih očnjaka (20).

Velika većina impaktiranih MM2 u našem uzorku (89%) bila je mezijalno nagnuta pod kutom od 30 do 70 stupnjeva (prosjek 47). Nagib je bio mnogo veći na impaktiranoj strani (p<0,001) negoli na suprotnoj gdje je iznosio između 1 i 18 stupnjeva (prosjek 10). Taj rezultat pokazuje dvostruko veće inicijalne vrijednosti mezijalnog nagiba impaktiranih MM2 u usporedbi s 15 do 65 stupnjeva kod bijelih Britanaca (7), ili od 13 do 75 stupnjeva kod kineske djece u Hong Kongu (4). Uočeno je da prije tretmana nagib MM2 od 24 ili više stupnjeva najavljuje moguću zaglavljenost te da takvi pacijenti imaju visok rizik od impakcije (21). Sama činjenica da je mezijalni nagib toliko čest kod impakcije, navodi na zaključak da su nagib, smjer izbijanja te neravnomjerni razvoj korijena (distalni veći od mezijalnog) glavni uzroci zaglavljenosti, a manjak prostora je sekundaran (6).

Podjela prema spolovima u slučaju impakcije MM2 kod kinesko-američke djece jest 41 (58%) dječak i 30 (42%) dje-

roborate the two-three times higher frequency reported for impacted MM3 in Singapore Chinese than in white population (16).

Crowding and arch-length deficiency in the posterior or even in the anterior segments of the mandibular arch have been suggested as the most common predisposed factors for MM2 impaction (2,5,7). Evans reported a considerable increase in the prevalence of MM2 impaction in Bristol, England during a 10-year study period. Her explanation was that change in the pattern of extraction of the MM1s, which are larger teeth, to the extraction pattern of the first premolars, which are smaller teeth, was the main reason for space shortage for the MM2 resulting in its impaction (7). In addition, she found a close relationship between unilateral MM2 impaction and a mandibular midline shift toward the impacted side, resulting in arch length deficiency on that side (7).

Crowding in the posterior segment of the arch resulting in MM2 impaction was also suggested earlier by Buchner (17). It has been reported that in Chinese people tooth size is larger than in Caucasians (18), which may partially explain the higher prevalence of MM2 impactions in Chinese people. It was suggested that the genetic factors that control dental morphogenesis also affect tooth size (19).

In our sample, the distance between MM1 and the anterior border of the ramus, which is the space where the MM2 develops and erupts, was significantly smaller (p<0.001) in the impacted side compared with the non-impacted side, suggesting a space shortage for the MM2.

Because both MM2 and second premolars (Pm2) erupt at a similar dental age, these two erupting teeth may often compete for space in the posterior region of the mandibular arch. This may result in arch shortage or posterior crowding, and cause an impaction of the second molar, in cases where Pm2 erupts ahead of MM2.

In addition, the developing third molar bud may also compete for space behind and above the second molar, increasing the posterior crowding and contributing to MM2 impaction (11). A possible mechanism for mesial impaction due to MM2 roots length difference, presenting a shorter mesial root than the distal, was suggested (6).

Unlike reports that the majority of MM2 impaction is a result of arch length deficiency (5), excess space in the molar region may allow the developing second molar to incline more mesially and become impacted (9). It has been suggested that the developing second molar needs the close guidance of the distal root of the first molar for normal eruption, a situation similar to the eruption of the maxillary canines which requires the guidance of the lateral incisor root (20).

The great majority of the impacted MM2s in our sample (89%) were mesially angulated with the angle ranging from 30 to 70 degrees (mean of 47 degrees), significantly larger (p<0.001) than in the non-impacted side which ranged from 1 to 18 degrees (mean of 10 degrees). This suggests two-fold higher initial mesial angulation of the impacted MM2s compared with the 15 – 65 degrees reported for white English people (7), or the 13 – 75 degrees reported for Chinese - Hong Kong children (4). It has been reported that patients with pretreatment MM2 angulation of 24 degrees or greater

vojčica, odnosno 1,36 posto prema 1,0 posto. Ti su rezultati u skladu s istraživanjima obavljenima na švedskoj djeci (5) ali ne slažu se sa studijama u kojima su sudjelovala kineska djeca iz Hong Konga kod koje je učeno više djevojčica s zaglavljenošću MM2 (4). Naši rezultati pokazuju dvostruko češću impakciju na lijevoj strani čeljusti negoli na desnoj – 26 (37%) prema 13 (18%) Ti rezultati idu u prilog onima dobivenima za kinesku djecu u Hong Kongu, ali su u suprotnosti s istraživanjima provedenima u Švedskoj gdje je dominirala impakcija na desnoj strani (5). Ljevostrana dominacija zabilježena je i za druge dentalne anomalije, kao što su, primjerice, nedostatak drugoga maksilarnog sjekutića te mnogobrojne kraniofacijalne anomalije, uključujući ljevostrani rascjep usnice i nepca. Razlozi za ljevostranu dominaciju još se ne znaju i zahtijevaju daljnja istraživanja (22).

Zaključak

Impakcija MM2 kod ortodontski tretiranih kineskoameričkih pacijenata iznosila je 2,36 posto. Većina zaglavljenih kutnjaka u donjoj čeljusti bila je mezijalno nagnuta. Glavni uzrok impakcije je kraći mezijalni korijen, a sekundarni premalo prostora između MM1 i prednjeg ruba ramusa mandibule.

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have a reliable predictor of impending impaction and are at high risk of impaction (21). The fact that mesial angulation is so prevalent suggests that the eruption path, together with differential root development (distal root larger than mesial root) are the main triggers of impaction, while the space deficiency may be a secondary factor (6).

Gender distribution of MM2 impaction in Chinese-Americans was 41 (58%) males, and 30 (42%) females, for prevalences of 1.36%, and 1.0%, respectively. This is in agreement with the report in Swedish children (5), but unlike the findings for Chinese Hong Kong individuals where more females than males had MM2 impactions (4).

We found left side predominance with twice as many impactions on the left, 26 (37%), than on the right side, 13 (18%), similar to the report for Chinese Hong Kong children (4), but different from the findings of more right side impactions in Swedish children (5).

Left side predominance was reported for other dental anomalies such as missing maxillary lateral incisors, and numerous cranio-facial anomalies, including cleft lip and palate, for unknown reasons that still need to be explored (22).

Conclusions

A prevalence of 2.36% was found for MM2 impaction in orthodontically treated ethnic Chinese-American patients. Most of the impacted mandibular second molars were mesially angulated. The primary cause of their impaction is their shorter mesial root, and the secondary factor might be the space deficiency between the mandibular first molar and the anterior border of the ramus.

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Conflict of Interest Statement

The authors of the manuscript state that sources of support and institutional affiliations is proper and does not imply any conflict of interest.

Abstract

Objectives: To determine the prevalence and characteristic features of mandibular permanent second molar impaction in a large sample of ethnic Chinese-American orthodontic patients. **Materials and methods:** Panoramic radiographs of 3000 consecutively orthodontically treated Chinese-American school children aged 11-15 years were studied for mandibular second molar impaction. Their anatomic position and angulation relative to the adjacent teeth were recorded and evaluated. **Results:** A total of 103 mandibular second molar impactions both unilateral and bilateral were detected in 71 Chinese-American patients with a prevalence of 2.36%. The significant majority of the mandibular second molar impactions (89%) were mesially inclined. Posterior mandibular crowding was detected in most of these impactions and the developing third molars were located along the root of the second molars, giving an impression of an overlap on the two-dimensional panoramic radiographs. **Conclusions:** Chinese-American orthodontic patients present a prevalence rate of 2.36% in mandibular second molar impactions, most of them mesially inclined in posteriorly crowded arches and in close proximity of the developing third molars. A possible mechanism for their impaction is the predominant mesial angulation, possibly caused by the different stages of root development (distal root more developed than the mesial root). The posterior space deficiency appears to be less critical, thus a secondary factor. Early detection and an appropriate orthodontic treatment are recommended for best clinical outcome.

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