

The Treatment of Class III Malocclusion in Early Mixed Dentition: Two Case Reports

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SUMMARY

Class III malocclusion is orthodontic anomaly where mandibular arch is in mesial position to maxillary arch. Reasons for Class III malocclusion can be found in mandibular prognathism, maxillary retrognathism or combination of these two. In most cases of mandibular prognathism, it is necessary to postpone the treatment until the growth ceases. However, if certain conditions are accomplished it is possible to start early treatment of class III malocclusion to improve occlusal relations and provide more favorable environment for future growth. The aim of this study was to present treatment of two patients with Class III malocclusion in early mixed dentition, using two different appliances: Delaire mask and Frankel functional regulator type 3. The treatment with Delaire mask resulted in rotation of maxilla downward and forward due to the angle of extraoral part of the mask to the occlusal plane that was modified to be almost 45°. At the end of the treatment facial esthetics was significantly improved. Moving maxilla forward resulted in straight profile, whereas moving maxilla downward lead to coordination of upper, middle and lower facial third. The result of the treatment in patient who used Frankel functional regulator was correction of anterior crossbite by premaxilla development and incisors protrusion. Significant differences in SNA, SNB and ANB angle values at the beginning and at the end of the treatment were not found suggesting that most changes were dental but not skeletal.

Keywords: class III malocclusion; early treatment; Delaire mask; Frankel functional regulator

INTRODUCTION

Class III malocclusion is orthodontic anomaly where mandibular arch is in mesial position in comparison to maxillary arch [1]. The diagnosis is made based on decreased value of ANB angle in cephalometric analysis [2]. Class III malocclusion can be caused by mandibular prognathism and/or overdeveloped mandible, maxillary retrognathism and/or underdeveloped maxilla or combination of both. In most cases of true mandibular prognathism, it is necessary to postpone the treatment until growth ceases. Once growth is completed, there are two treatment options: combined orthodontic therapy and orthognathic surgery and camouflage therapy [1].

When Class III malocclusion is caused by sagittally and/or vertically undeveloped maxilla, therapy with Delaire mask (face mask) is recommended. The aim of this therapy is to advance maxilla in downward and forward direction, until bone sutures are completely closed. Significant improvement in sagittal position of maxilla was reported when treatment started in early mixed dentition, compared to the group when treatment commenced in late mixed dentition [1]. A study that compared results of the treatment with Delaire mask in patients in early mixed dentition and patients in late mixed dentition showed that sagittal growth of maxilla was found only in patients in the first group [3]. Cephalometric evaluation of patients who underwent therapy with Delaire mask showed significant hard and soft tissue changes after the treatment.

Skeletal changes were primarily result of anterior and vertical movement of maxilla [4]. Early treatment of Class III malocclusion can also be done using Frankel functional regulator type 3. Best results are achieved in early mixed dentition, after the eruption of permanent first molars, in children with negative overjet of 4-5 mm [5].

The aim of this study was to present the treatment of Class III malocclusion in early mixed dentition in two patients treated with two different appliances: Delaire mask and Frankel functional regulator type 3.

REPORT OF CASE 1

A 7-year-old girl was referred to the Clinic of Orthodontics, University of Belgrade with the main complaint of anterior crossbite and undeveloped premaxilla. Familiar mandibular prognathism was present (father). Extraoral examination revealed concave profile and shorter lower face third (Figure 1). Intraoral examination showed that the girl was in early mixed dentition, negative overjet was 1.5 mm and Class I relationship of deciduous canines and first permanent molars was observed (Figure 2). Radiographic examination showed hypodontia of upper right second premolar and lower left second premolar (Figure 3). Cephalometric evaluation showed that the value of SNA angle was 78.7° (maxillary retrognathism), SNB angle was 83.4° (mandibular prognathism) and ANB was -4.7° (Class III malocclusion). Sum of saddle, articular and



Figure 1. Extraoral photos before the treatment: frontal and profile view

Slika 1. Anfas i profil pacijentkinje pre terapije

gonial angle was 384° (convergent growth). The angle between lower incisor axis and mandibular plane was 100° (retrusion).

It was decided to begin early treatment of Class III malocclusion. The main goal was to achieve normal overjet and overbite and correct sagittal and vertical position of maxilla to mandible. Since the results of cephalometric analysis showed convergent growth, it was decided to start the treatment with Delaire mask. Intraoral part of Delaire mask was fixed on deciduous canines and molars while the extraoral part of the mask was set up to create the angle of 45° with occlusal plane. The instruction was given to the patient and her parents that the mask should be worn 12-14 hours a day.

Two months after the beginning of therapy positive overjet and Class I occlusion of deciduous canines and permanent first molars was achieved (Figure 4). Patient used Delaire mask for additional six months, therefore at



Figure 2. Intraoral photos before the treatment: occlusion

Slika 2. Okluzija: pacijentkinja pre terapije



Figure 3. Orthopantomograph and lateral radiograph before the treatment

Slika 3. Ortopantomograski i profilni telerendgenski snimak pacijentkinje pre terapije



Figure 4. Intraoral photos: occlusion after 2 months of the treatment – correction of anterior crossbite

Slika 4. Faza terapije – postignut pravilan preklap sekutića nakon dva meseca lečenja



Figure 5. Intraoral photos: occlusion after Delaire mask treatment
Slika 5. Okluzija nakon terapije Delerovom maskom



Figure 6. Intraoral and extraoral photos at the end of the treatment
Slika 6. Okluzija, anfas i profil nakon retencione faze



Figure 7. Extraoral photos at the end of the treatment: frontal and profile view
Slika 7. Anfas i profil nakon retencione faze terapije



Figure 8. Extraoral photos before the treatment: frontal and profile view
Slika 8. Anfas i profil pacijenta pre lečenja

the end of the treatment canines and molars were in half Class II relationship (Figure 5). In this stage permanent incisors were erupting.

In the next stage of the treatment, it was necessary to achieve normal transverse dental relationship (narrow upper arch) and keep sagittal relationship of maxilla and mandible. The retention phase was performed with active appliance for transversal maxillary expansion. After 11 months of retention phase, the patient had half Class II occlusion, normal transverse dental relationship and permanent incisors overjet (Figure 6). Facial esthetics of the patient was also significantly improved (Figure 7).

REPORT OF CASE 2

A 7-year-old boy was referred to the Clinic of Orthodontics in Belgrade with chief complaint of anterior crossbite. Extraoral examination revealed straight profile and longer lower facial third (Figure 8). Intraoral examination showed negative overjet of 1.5 mm and Class I occlusion on deciduous canines and permanent first molars (Figure 9). Radiographic examination showed all permanent teeth present in their developmental stages (Figure 10). Cephalometric evaluation showed maxillar and mandibular prognathism (SNA was 85.8°, SNB was 88.5°) and ANB



Figure 9. Intraoral photos before the treatment
Slika 9. Okluzija pacijenta pre lečenja



Figure 10. Lateral radiograph before the treatment
Slika 10. Telerendgenski profilni snimak pre lečenja

angle was -2.7° (skeletal class III). Sum of saddle, articular and gonial angle was 384° (convergent growth).

Frankel functional regulator type 3 was chosen for orthodontic treatment. The patient and his parents were given instructions that the appliance should be worn 24 hours a day, except during meals. Two months after the beginning of therapy, with good patient's cooperation, positive overjet was achieved while the Class I occlusion was kept in posterior segments (Figure 11). The correction of anterior crossbite of permanent incisors was achieved 10 months after the beginning of the treatment (Figures 12 and 13).

The patient continued to use Frankel functional regulator type 3, and 14 months after the beginning of therapy a new lateral radiograph was taken. New cephalometric analysis showed slightly increased SNA angle (87.7°) and sum of saddle, articular and gonial angle (386.9°).

Two years after the beginning of therapy, cephalometric analysis did not show significant difference with

previous one, except SNB angle was increased from 86.5° to 87.6° . The patient continued to use Frankel functional regulator during the retention phase, 12-14 hours a day.

DISCUSSION

Positive predictive factors for early class III malocclusion treatment are good facial esthetics, mild skeletal disharmony, no familiar prognathism, convergent facial type, symmetric condylar growth and growing patient with good cooperation. If these conditions are not present, the treatment should be postponed until growth is over. Also, patients should be informed that even the first phase of therapy is successful, it does not mean that orthognatic surgery will be avoided in future, because the course of the treatment depends on patient's growth [2]. The aims of early therapy of Class III malocclusion are preventing progressive, irreversible soft tissue or bony changes, improving skeletal discrepancies and providing more favorable environment for future growth, improving occlusal function, simplifying second phase of the treatment and minimizing the need for orthognatic surgery, providing more pleasant facial esthetics and improving psychosocial development of a child [2].

In the treatment that includes Delaire mask, to achieve more skeletal than dental effects it is important to band upper teeth together. The anchorage of Delaire mask is on forehead and chin, while elastics fixed on extraoral and intraoral part produce force to move maxilla forward. The force of 350-450 g is used 12-14 hours a day and it should be directed with 30° angle to occlusal plane to avoid uncontrolled vertical growth. Face mask almost inevitably results in upper incisors protrusion and rotation of mandible downward and backward. That is why an ideal patient for Delaire mask should have normal or retruded upper incisors and normal or shorter lower face third. With accurate indication for Delaire mask and optimal patient's cooperation, 3-4 months after the beginning of the treatment, correction of anterior crossbite is expected. In



Figure 11. Intraoral photos: occlusion after two months; correction of anterior crossbite
Slika 11. Faza terapije: nakon dva meseca postignut preklop mlečnih sekutića



Figure 12. Intraoral photos after the first phase of treatment with Frankel functional regulator type 3
Slika 12. Okluzija pacijenta nakon prve faze terapije Frenklovim regulatorom funkcije tip 3



Figure 13. Extraoral photos after the first phase of treatment with Frankel functional regulator type 3: frontal and profile view
Slika 13. Anfas i profil pacijenta nakon prve faze terapije Frenklovim regulatorom funkcije tip 3

one prospective clinical trial, overjet correction was found to be the result of forward maxillary movement (31%), backward movement of mandible (21%), labial movement of maxillary incisors (28%), and lingual movement of mandibular incisors (20%) [6]. In the next 4-6 months molar relationship is expected to correct. The best results are expected in patients who have maxillary retrognathism, not the combination of maxillary retrognathism and mandibular prognathism [1].

Our patient at the end of treatment achieved good result despite of maxillary retrognathism and mandibular prognathism present at the beginning of the treatment and familiar mandibular prognathism. Because of vertically undeveloped maxilla, the angle of force directed to maxilla was modified to 45°. The aim of this modification was to increase vertical component of the force to improve vertical development. This resulted in maxilla rotation forward and downward. At the end of the treatment facial aesthetics was significantly improved (straight profile instead of concave and coordinated upper, middle and lower face third). It has been reported that early treatment of orthodontic anomalies is related to improved self-esteem and reduction of negative social experiences [7]. Apart from facial esthetics improvement, oclusal correction in the sagittal plane was achieved and good conditions provided for normal occlusion in permanent dentition. During the treatment, hypercorrection of occlusal sagittal relationship was achieved to avoid possible relapse that can occur during the period of growth, considering the presence of familiar mandibular prognathism.

Specific design of Frankel functional regulator with lip pads and buccal shields has 3 main roles: to eliminate pressure of perioral muscles on undeveloped maxilla, exert the pressure on maxillary tissues and periost, stimulate bone growth and distribute upper lip pressure on mandible using lower labial arch wire [8]. According to Frankel [9], buccal shields should not be in close contact with maxillary alveolar ridges, so that forward growth is enabled. The Frankel functional regulator therapy results in maxillary incisors protrusion and mandibular incisors retrusion [10, 11]. During the treatment with Frankel appliance, there is an active phase (24-30 months) and reten-

tion phase (24 months). In active phase the appliance is used 24 hours a day, except during meals, and in retention phase it is recommended that appliance is used just during night sleep, to keep the results achieved during the active phase. If during the treatment, apart from correction of anterior crossbite, unforced contact of lips is achieved, it is considered that the risk of relapse is decreased [5].

The patient treated with Frankel functional regulator at the end of therapy had relatively good facial aesthetics. Since the cephalometric evaluation showed maxillary prognathism, it was decided to start the therapy with functional appliance. Delaire mask was not an option because the ideal patient for Delaire mask therapy has maxillary retrognathism and shorter lower face third.

Cephalometric evaluation did not show significant changes in SNA, SNB and ANB values at the beginning and at the end of the treatment. These results show that most changes after the treatment with functional appliance are dental, not skeletal. Our results are in correlation with the results of a study that had aim to compare the effects of functional appliances and Delaire mask. In the first group there was a slight increase of SNB value, whereas in the face mask group SNB angle was decreased 0.8° [12]. Although there were no significant changes on skeletal structures, correction of anterior crossbite was achieved by effect of lip pads and protrusion arch. Lip pads eliminate lip pressure on one side, while they distribute pressure on maxillary tissues and periost and stimulate bone apposition on the other side. This results in premaxilla development in the sagittal plane. The protrusion of arch is achieved by upper incisors protrusion. Combination of premaxilla development and upper incisors protrusion corrected anterior crossbite in our case.

For early treatment of Class III malocclusion age is very important. Franchi et al. [13] concluded that Class III malocclusion treatment is more efficient if starts in early stage of dentition development (deciduous and early mixed dentition). Early treatment produced significant favorable postpubertal modifications in both maxillary and mandibular structures, whereas late treatment induced only a significant restriction of mandibular growth. It would be expected in early mixed dentition, when cranial structures growth is intensive and bone structures elastic, to change anteroposterior discrepancy between maxilla and mandible. However, there are limitations like late growth that causes relapse. Even after early therapy, long lasting results will depend on many factors: maxillary and mandibular growth potential, patient's age, familiar anamnesis, genetic impacts and patient's cooperation [4]. That is why hypercorrection in sagittal plane is recommended to compensate these negative factors [2, 14].

Early treatment of Class III malocclusion can be successful especially if primary etiological factor is undeveloped maxilla, dental or other functional factors. Frankle functional regulator and Delaire mask can both achieve good results but it is important to keep results stable and prevent relapse. Since Class III malocclusion has unpredictable nature, it is important that orthodontist carefully analyzes all factors that affect the outcome of the treatment.

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Terapija malokluzija III klase u ranoj mešovitoj denticiji – prikaz dva slučaja

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KRATAK SADRŽAJ

Skeletna malokluzija III klase je nesklad u međusobnom odnosu gornje i donje vilice, jer je donja vilica postavljena mezijalnije u odnosu na gornju. Uzrok nastanka skeletne malokluzije III klase može biti mandibularni prognatizam, maksilarni retrognatizam ili kombinacija ova dva uzroka. U slučaju isuviše razvijene donje vilice najčešće je potrebno sačekati završetak rasta, kako bi se primenilo konačno lečenje. Međutim, ako su ispunjeni određeni uslovi, moguće je primeniti ranu terapiju III klase, da bi se poboljšali okluzalni odnosi i obezbedila dobra osnova za dalji rast. Cilj ovog rada bio je da se prikaže terapijski efekat dva slučaja malokluzije III klase u ranom uzrastu pomoću različitih ortodontskih aparata: Delerove maske i Frenklovog regulatora funkcije tip 3. Kod pacijentkinje koja je tokom lečenja nosila Delerovu masku gornja vilica je zarotirana unapred i nadole, jer je ugao delovanja sile modifikovan da bude skoro 45 stepeni. Na kraju lečenja postignut je znatno bolji izgled lica. Pomeranjem gornje vilice unapred postignut je prav profil, dok je pomeranje nadole dovelo do usklađivanja visine srednje trećine lica sa gornjom i donjom. Kod pacijenta kod kojeg je tokom lečenja primenjena terapija Frenklovim regulatorom funkcije tip 3 do korekcije obrnutog preklopa sekutića došlo je kombinacijom razvijanja premaksile i protruzije sekutića. Značajne promene u vrednostima uglova SNA, SNB i ANB nisu zabeležene na kraju terapije u odnosu na početak, što bi ukazivalo na to da su postignute promene uglavnom dentalne, a ne skeletne.

Ključne reči: malokluzija III klase; rana terapija; Delerova maska; Frenklov regulator funkcije

UVOD

Skeletni mezijalni zagrižaj ili skeletna malokluzija III klase jesu nesklad u anteroposteriornom položaju i međusobnom odnosu gornje i donje vilice, jer je donja vilica postavljena mezijalnije u odnosu na gornju [1]. Dijagnoza ovog ortodontskog poremećaja postavlja se na osnovu analize profilnog telerendgenskog snimka gde je smanjena vrednost ugla ANB [2]. Uzrok nastanka skeletne malokluzije III klase može biti mandibularni prognatizam (isuviše razvijena i/ili prominentna donja vilica), zatim maksilarni retrognatizam (nedovoljno razvijena ili distalno postavljena gornja vilica) ili kombinacija ova dva uzroka. U slučaju suviše razvijene donje vilice najčešće je potrebno sačekati završetak rasta, kako bi se primenilo konačno lečenje, koje može biti kombinacija ortodontske terapije i ortognatske hirurgije ili terapija ortodontskom kamuflažom [1].

Kada je uzrok skeletne III klase anteroposteriorno i vertikalno nerazvijena gornja vilica, preporučuje se terapija facijalnom maskom (Delerovom maskom), koja pomera gornju vilicu napred i nadole, što dovodi do stvaranja kosti na gornjim i zadnjim suturama. Smatra se da je najbolji period za primenu facijalne maske nakon nicanja stalnih sekutića pa do 10. godine [1]. U studiji čiji je cilj bio poređenje rezultata terapije Delerovom maskom kod pacijenata u ranoj mešovitoj denticiji i pacijenata u kasnoj mešovitoj denticiji sagitalni rast gornje vilice zabeležen je samo kod ispitanika prve grupe [3]. Kefalometrijske analize su pokazale značajne promene koštanih i mekotivnih struktura, dok su skeletne promene bile prvenstveno rezultat anteriornog i vertikalnog pomeranja gornje vilice [4].

U ranoj terapiji skeletnog mezijalnog zagrižaja uzrokovnog nerazvijenom gornjom vilicom može se koristiti i Frenklov regulator funkcije, predstavnik tkivno nošenih funkcionalnih aparata. Najbolji terapijski rezultati postižu se u periodu rane mešovite denticije, nakon nicanja stalnih molara, kod dece sa negativnim incizalnim stepenikom, čija je vrednost 4–5 mm [5].

Cilj ovog rada bio je da se prikaže terapijski efekat dva slučaja malokluzije III klase u ranom uzrastu pomoću različitih

ortodontskih aparata: Delerove maske i Frenklovog regulatora funkcije tip 3.

PRIKAZ PRVOG SLUČAJA

Sedmogodišnja devojčica upućena je na Kliniku za ortopediju vilica u Beogradu zbog obrnutog preklopa sekutića i nerazvijene premaksile. U porodičnoj anamnezi zabeležena je malokluzija III klase kod oca. Ekstraoralnim kliničkim pregledom uočeni su konkavan profil i skraćena donja trećina lica (Slika 1). Intraoralnim pregledom je ustanovljeno da devojčica ima ranu mešovitu denticiju. Izmeren je obrnut preklap sekutića od 1,5 mm, kao i odnos I klase po Englu (*Angle*) kod mlečnih očnjaka i stalnih prvih molara (Slika 2). Na ortopantomografskom snimku uočena je hipodoncija gornjeg desnog i donjeg levog drugog premolara (Slika 3). Kefalometrijskom analizom dobijene su vrednosti ugla SNA od 78.7° (maksilarni retrognatizam), SNB od 83.4° (mandibularni prognatizam) i ANB od -4.7° (III skeletna klasa). Zbir uglova Bjorkovog poligona od 384° govori o horizontalnom tipu rasta. Izmereni ugao donjih sekutića u odnosu na mandibularnu ravan bio je 100° (retruzija donjih sekutića).

Kod ove pacijentkinje je, na osnovu kliničkog pregleda i podataka dobijenih analizom modela i profilnih snimaka, odlučeno da se započne s ranom terapijom. Glavni cilj je bio da se uspostavi normalan sagitalni i vertikalni preklap sekutića, te obezbedi pravilan položaj gornje vilice u odnosu na donju. S obzirom na to da je kefalometrijska analiza pokazala horizontalni tip rasta, odlučeno je da se započne terapija Delerovom maskom. Intraoralni deo Delerove maske cementiran je na mlečne očnjake i molare, a zatim je ekstraoralni deo podešen tako da sila bude pod uglom od 45° u odnosu na okluzalnu ravan zbog vertikalno i sagitalno nerazvijene gornje vilice. Pacijentkinji i roditeljima su data uputstva o nošenju Delerove maske 12–14 sati dnevno.

Nakon dva meseca terapije postignut je pravilan odnos sekutića, s očuvanim odnosom I klase po Englu u regiji molara

i očnjaka (Slika 4). Pacijentkinja je nastavila da nosi Delerovu masku još šest meseci nakon postignutog pravilnog preklopa sekutića, tako da je na kraju lečenja postignut odnos mlečnih očnjaka i prvih stalnih molara polu druge klase po Englu (Slika 5). Stalni gornji centralni sekutići su u ovoj fazi nicali.

U sledećoj fazi terapije bilo je potrebno postići pravilan odnos zuba u transversalnom pravcu (uskost gornje vilice) i održati postignut odnos u sagitalnom pravcu. Odlučeno je da se retenciona faza terapije nastavi gornjim aktivnim aparatom sa šrafom za transversalno širenje. Nakon 11 meseci i završetka retencione faze postignuti su okluzija polu druge klase po Englu, pravilan transversalni odnos zuba i pravilan preklap stalnih sekutića (Slika 6). Na kraju terapije značajno je poboljšan izgled lica pacientkinje (Slika 7).

PRIKAZ DRUGOG SLUČAJA

Sedmogodišnji dečak primljen je na Kliniku za ortopediju vilica u Beogradu sa glavnim problemom obrnutog preklopa sekutića. Ekstraoralnim pregledom uočeni su prav profil i povećana donja trećina lica (Slika 8). Intraoralnim pregledom zabeleženi su pravilan transversalni odnos zuba, obrnut preklap sekutića od 1,5 mm i odnos mlečnih očnjaka i prvih stalnih molara I klase po Englu (Slika 9). Na ortopantomografskom snimku primećeni su svi zameci stalnih zuba (Slika 10). Kefalometrijska analiza profilnog snimka na početku terapije pokazala je vrednosti maksilarnog i mandibularnog prognatizma (SNA je bio 85.8°, a SNB 88.5°) i ugla ANB od -2.7°, koji pokazuje III skeletnu klasu. Zbir uglova Bjorkovog poligona bio je 384°, što je govorilo u prilog horizontalnom tipu rasta.

Započeta je terapija Frenklovim regulatorom funkcije za III klasu i data su uputstva pacijentu o nošenju aparata 24 časa dnevno osim tokom jedenja. Dva meseca od početka lečenja intenzivnim nošenjem aparata postignut je preklap mlečnih sekutića, dok je kod bočnih zuba sačuvan odnos I klase po Englu (Slika 11). Nakon 10 meseci terapije postignut je pravilan odnos stalnih sekutića (Slike 12 i 13).

Pacijent je nastavio da nosi Frenklov regulator funkcije, a 14 meseci od početka terapije urađen je kontrolni profilni teleradiografski snimak. Vrednost ugla SNA se vrlo malo povećala (87.7°), kao i zbir uglova Bjorkovog poligona (386.9°).

Tačno dve godine od početka terapije urađen je novi profilni teleradiogram koji nije pokazao veće skeletne promene u odnosu na prethodni osim ugla SNB, koji se sa 86.5° povećao na 87.6°. Pacijent je nastavio retencionu fazu terapije Frenklovim regulatorom funkcije za III klasu, ali sa smanjenim brojem sati nošenja (12–14 sati).

DISKUSIJA

Indikacije za ranu terapiju malokluzije III klase su dobra estetika lica, blaga skeletna disharmonija, negativna porodična anamneza mandibularnog prognatizma, konvergentni tip lica, simetrični rast kondila i pacijent od kojeg se očekuje dobra saradnja. Kada većina ovih uslova nije ispunjena, terapiju bi trebalo odložiti dok se ne završi rast. Takođe, pacijente bi trebalo obavestiti da, čak i ukoliko je prvi deo terapije uspešan, to ne znači da će ortognatska hirurgija u kasnijoj fazi biti izbegnuta,

jer dalji tok lečenja umnogome zavisi od rasta pacijenta [2]. Ciljevi rane terapije skeletnih malokluzija III klase su: da se spreče nepovratne promene koštanih i mekotkivnih struktura, ublaže skeletne diskrepancije i obezbedi dobra osnova za budući rast, poboljšaju okluzalni odnosi, olakša druga faza terapije i smanji potreba za ortognatskom hirurgijom, te obezbedi bolji izgled lica i time poboljša psihosocijalni razvoj deteta [2].

U terapiji Delerovom maskom, da bi se dobio skeletni a ne dentalni efekat, potrebno je zube u gornjoj vilici povezati u celinu. Intraoralni deo Delerove maske može biti cementiran ili mobilan. Uporište kod obrazne maske čine čelo i brada, dok gumice koje se pričvršćuju na masku proizvode silu koja pomera gornju vilicu napred. Sila jačine 350–450 g se primenjuje 12–14 sati dnevno. Sila koja usmerava gornju vilicu trebalo bi da bude pod uglom od 30° u odnosu na okluzalnu ravan, kako ne bi došlo do nekontrolisanog otvaranja zagrižaja tokom terapije. U terapiji obraznom maskom gotovo su neizbežne protruzija gornjih sekutića i rotacija donje vilice nadole i unazad. Zbog toga bi idealan pacijent za terapiju obraznom maskom trebalo da ima normalno postavljene ili retrudirane gornje sekutiće i normalnu ili skraćenu prednju visinu lica. Kod adekvatno postavljene indikacije i optimalnog nošenja aparata očekuje se ispravljanje obrnutog preklopa sekutića nakon 3–4 meseca, dok se u narednih 4–6 meseci terapije očekuje i korekcija odnosa molara. Jedna prospektivna studija pokazala je da su razlozi korekcije obrnutog odnosa sekutića: pomeranje gornje vilice unapred (31% slučajeva), pomeranje donje vilice unazad (21%), labijalno pomeranje gornjih sekutića (28%) i lingvalno pomeranje donjih sekutića (20%) [6]. Ova vrsta terapije ima najbolji rezultat kod pacijenata kod kojih je uzrok anomalije samo nerazvijena gornja vilica, a ne kombinacija maksilarnog retrognatizma i mandibularnog prognatizma [1].

Kod naše pacientkinje postignut je dobar rezultat i pored toga što je na početku lečenja pored maksilarnog retrognatizma postojao i mandibularni prognatizam, kao i pozitivna porodična anamneza. Zbog vertikalne nerazvijenosti gornje vilice modifikovan je ugao delovanja sile sa 30° na skoro 45°. Cilj ove modifikacije bio je da se poveća vertikalna komponenta sile, kako bi se korigovala vertikalna nerazvijenost. Zahvaljujući ovakvom delovanju Delerove maske, gornja vilica je zarotirana unapred i nadole. Na kraju terapije postignut je znatno bolji izgled lica. Pomeranjem gornje vilice unapred umesto konkavnog postignut je prav profil, dok je pomeranje nadole dovelo do usklađivanja visine srednje trećine lica sa gornjom i donjom. U literaturi se navodi da rana terapija ortodontskih anomalija dovodi do većeg samopouzdanja deteta i smanjenja loših socijalnih iskustava [7]. Pored poboljšanja izgleda lica, korigovan je okluzalni odnos u sagitalnom pravcu i obezbedeni su dobri uslovi za razvoj pravilne okluzije u stalnoj denticiji. Kod pacientkinje je tokom terapije Delerovom maskom postignuta hiperkorekcija okluzalnog odnosa, kako bi se predupredio eventualni recidiv, koji može nastati tokom rasta, s obzirom na činjenicu da je porodična anamneza bila pozitivna i da je bio zastupljen i mandibularni prognatizam.

Specifičan dizajn Frenklovog regulatora funkcije s labijalnim pelotama i bukalnim štitovima ima trojaku ulogu: da oslobađa pritisak usana na nerazvijenu gornju vilicu, da prenese pritisak na tkivo i perioist gornje vilice i stimuliše rast kosti, te da prenese pritisak gornje usne na donju vilicu preko donjeg labijalnog luka koji vrši retruziju [8]. Prema navodima Frenkla (*Fränkel*) [9],

labijalne pelote i bukalni štitovi su odmaknuti od alveolarnih nastavaka gornje vilice, kako bi se omogućio njen rast unapred i transverzalno. Štitovi su postavljeni uz alveolarne nastavke donje vilice, da bi se zadržao njen rast ili usmerio ka nazad. Nakon terapije Frenklovim regulatorom funkcije III dolazi do protruzije gornjih i retruzije donjih sekutića [10, 11]. Tokom primene ovog aparata razlikuju se aktivna faza (24–30 meseci) i retenciona faza (24 meseca). U aktivnoj fazi aparat se nosi 24 časa dnevno, osim za vreme obedovanja, dok se u retencionoju fazi nosi samo noću, kako bi se sačuvali rezultati postignuti u aktivnoj fazi. Ukoliko se tokom terapije pored ispravljanja obrnutog prekopa sekutića postigne i neusiljen kontakt gornje i donje usne, smatra se da su uklonjene nepravilnosti cirkumoralne muskulature, a time smanjen rizik za nastanak recidiva [5].

Pacijent kod koga je lečenje izvedeno funkcionalnim aparatom na početku terapije imao je relativno dobar izgled lica. Zbog maksilarnog prognatizma odlučeno je da se primeni Frenklov regulator funkcije, a ne Delerova maska, jer bi za tu vrstu terapije bio idealan pacijent s maksilarnim retrognatizmom i smanjenom donjom trećinom lica. Kod ovog pacijenta kefalometrijska analiza nije pokazala značajne promene u vrednostima uglova SNA, SNB i ANB na kraju lečenja u odnosu na početak. Ovi rezultati govore u prilog tome da su promene dobijene terapijom funkcionalnim aparatima uglavnom dentalne, a ne skeletne. To je u skladu s rezultatima studije čiji je cilj bio poređenje efekata funkcionalnih aparata i obrazne maske. U prvoj grupi došlo je do neznatnog povećanja ugla SNB, kao i kod našeg pacijenta, dok je u grupi ispitanika koji su koristili obraznu masku SNB smanjen za $0,8^\circ$ [12]. Iako nije došlo do promena na nivou skeletnih struktura, korigovan je obrnut preklap sekutića. Pravilan preklap sekutića postignut je zahvaljujući delovanju labijalnih pelota i protruzionog luka. Pelote koje odstoje od alveolarnog grebena eliminišu pritisak usana, s jedne strane, dok sa druge strane stvaraju silu vuče koja dovodi do apozicije

kosti. Zahvaljujući tome dolazi do razvijanja premaksile u sagitalnom pravcu. Protruzioni luk omogućava protruziju sekutića. Kombinacija razvijanja premaksile i protruzije sekutića dovela je do korekcije obrnutog preklopa sekutića kod prikazanog pacijenta.

Kod rane terapije malokluzija III klase veoma je važno u kojem uzrastu počinje lečenje. Franki (*Franchi*) i saradnici [13] su zaključili da su terapija i kontrola malokluzije III klase mnogo efikasnije kada se započnu u početnoj fazi razvoja denticije (kraj mlečne i početak mešovite denticije). Kod pacijenata kod kojih je primenjena rana terapija došlo je do povoljne postpubertetske modifikacije rasta i na gornjoj i na donjoj vilici, dok je kod pacijenata sa kasno primenjenom terapijom došlo samo do smanjenja rasta donje vilice. Očekivalo bi se da je u periodu mlečne denticije, kada je rast kranijalnih struktura intenzivan a koštane strukture elastične, moguće uticati na skeletni nesklad između gornje i donje vilice. Međutim, ograničavajući momenat je to što pacijent nastavlja da raste po unapred utvrđenom obrascu, pa su rezultati lečenja skloni recidivu. Čak i s ranom terapijom rezultat će zavisiti od mnogo faktora: maksilarni i mandibularni potencijal rasta, uzrast pacijenta, porodična anamneza, genetski uticaji i saradnja pacijenta tokom lečenja [4]. Zbog toga se preporučuje hiperkorekcija, kako bi se kompenzovali negativni faktori [2, 14], što je i postignuto kod prikazane pacijentkinje.

Rezultati rano započete terapije malokluzije III klase mogu biti zadovoljavajući ukoliko je njen cilj preusmeravanje rasta, i to prvenstveno kada je primarni etiološki faktor nerazvijena gornja vilica i/ili dentalni i funkcionalni faktori. I Frenklov regulator funkcije i Delerova maska mogu postići dobar rezultat, međutim, ono što je najbitnije za ishod lečenja jeste da se taj rezultat i željeni obrazac rasta zadrže, odnosno recidiv svede na najmanju moguću meru. S obzirom na nepredvidljivu prirodu malokluzije III klase, brojne faktore od kojih zavisi uspeh terapije ortodont mora pažljivo analizirati.