

## PROMENE GORNJE USNE POSLE HIRURŠKE KOREKCIJE PROGENIJE

### CHANGES OF THE UPPER LIP AFTER SURGICAL CORRECTION OF MANDIBULAR PROGNATHISM

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#### **Kratak sadržaj**

*Cilj istraživanja je bio da utvrdi i proceni efekte hirurške korekcije mandibularnog prognatizma na dužinu i položaj gornje usne.*

*Promene gornje usne su kefalometrijski analizirane kod 115 osoba (f=71; m=44) kod kojih je mandibularni prognatizam korigovan metodom sagitalnih osteotomija grane donje vilice. Svakom pacijentu su načinjena po dva profilna telerendgenska snimka glave, jedan pre i jedan nakon hirurške intervencije. Kefalometrijska analiza mekog profila lica je obavljena merenjem i poređenjem šest linearnih i dva angularna parametra. Dobijene vrednosti su statistički obrađene i evaluirane.*

*Primenjene hirurške korektivne procedure rezultirale su statistički značajnim promenama kod dva linearna parametra (incizalna stepenica i dužina gornje usne).*

*Promene gornje usne posle hirurške korekcije mandibularnog prognatizma pomoću sagitalnih klizajućih osteotomija grane donje vilice su minimalne i gotovo neznačajne. Značajno se menja jedino dužina gornje usne – postaje duža. Gornja usna se pomera za 15% ukupnog pomeranja struktura donje vilice.*

**Ključne reči:** mandibularni prognatizam, sagitalne osteotomije, kefalometrija, gornja usna

#### **Abstract**

*The aim of this study was to establish and estimate the effects of surgical correction of mandibular prognathism on the height and position of the upper lip.*

*The changes of the upper lip were analysed on 115 patients between 16 and 30 year of age (71 females and 44 males) who were subject to surgical correction of mandibular prognathism using the sagittal split ramus osteotomy. The lateral cephalometric radiographs were taken of each patient before and six months after the surgical procedure. The soft tissue cephalometric analysis included the measurements of six linear and two angular parameters. The obtained data were statistically processed and evaluated.*

*Statistical analysis revealed the significant changes in two linear cephalometric parameters after surgical procedure—the incisal step and the length of the upper lip.*

*The changes in the length and position of the upper lip after surgical correction of mandibular prognathism by means of sagittal split ramus osteotomy seem to be minor and clinically insignificant. Only the length of the upper lip was significantly changed. It became longer. The upper lip advancement amounted approximately 15% of the complete mandibular set-back during operation.*

**Key words:** mandibular prognathism, sagittal split ramus osteotomy, cephalometrics, upper lip

#### **Uvod**

Umetnici i anatomsu vekovima tragali za idealnim proporcijama lica koje prezentuju njegovu lepotu i harmoniju. Bez obzira na činjenicu da „idealna lica“ ustvari ne postoje, određene smernice koje ukazuju na normalne raspone facijalnih proporcija su veoma korisne u proceni facijalnih deformiteta i izradi odgovarajućeg plana terapije.<sup>1</sup>

#### **Introduction**

For several centuries artists and anatomists have sought to determine the ideal facial proportions that result in facial beauty and harmony. In spite of the fact, that there is no "ideal faces" some guidelines for the normal range of facial proportions are helpful in assessing the nature of facial deformities and performing the adequate treatment plan.<sup>1</sup>

Proporcije i konture mekih tkiva lica su determinisane skeletnim strukturama ispod njih, i pokazuju veliku varijabilnost zavisno od pola, godina starosti, telesne težine i okluzalnih odnosa. Istovremeno, raspored mekih tkiva može ponekad da prikriva nepravilnosti u tim odnosima. To prikrivanje je u zavisnosti od tipa nepravilnosti manje ili više izraženo i nije u direktnoj proporcionalnosti sa vizuelnim efektima.<sup>1,2</sup>

Specifična disharmonija lica poznata kao mandibularni prognatizam oduvek je privlačila pažnju i istraživača i kliničara. Iako relativno redak u jednoj populaciji, ovaj deformitet značajno utiče na kvalitet života što se reflektuje na broj individua koje traže lekarsku pomoć. Sasvim je razumljivo da su istraživači sem tumačenju etiologije ovog deformiteta, svoje napore usmerili ka razvoju mnogobrojnih metoda korekcije – od ortodontskih do hirurških.<sup>3,4</sup>

Korektivne hirurške procedure stvaraju nove morfološke i funkcionalne odnose u okviru orofacijalnog kompleksa sa ciljem da umanje deformitet i postignu optimalne rezultate.<sup>4,5</sup>

Međutim, funkcionalni i estetski rezultati ovih tretmana zavise u velikoj meri od izgleda mekotkivnih struktura glave i vrata. Stoga je jedan od glavnih zadataka hirurške korekcije facijalnih deformiteta, posebno mandibularnog prognatizma, da proceni individualne sposobnosti adaptacije mekih tkiva lica i obezbedi optimalne odnose između koštanih i mekotkivnih struktura.<sup>1,2</sup> Imajući u vidu da vizuelna procena izgleda lica praktično bazira na formi mekih tkiva, dok je objekat rada hirurga pri korekciji mandibularnog prognatizma koštano tkivo, nameće se potreba za preciznim kliničkim i kefalometrijskim procenivanjem efekata koje hirurška korekcija ostvaruje na mekim tkivima lica.

## **Cilj**

Cilj ove kefalometrijske studije bio je da utvrdi, proceni i opiše efekte hirurške korekcije mandibularnog prognatizma putem sagitalne klizajuće ramus osteotomije na položaj i dužinu gornje usne.

## **Materijal i metod**

Istraživanjem je obuhvaćeno 115 osoba kod kojih je na Klinici za maksilofacijalnu

Facial soft tissue proportions and contours are largely determined by the underlying facial skeleton and strongly influenced by sex, age, weight and occlusal relationships. At the same time, the great variability of the soft tissue contours can sometimes camouflage the present disorder in the skeletal and dental relationships. Depending on the type of disorder, the camouflage can be more or less expressed, and it is not always proportional to its visual effects.<sup>1,2</sup>

The special facial disharmony known as the mandibular prognathism has always attracted the attention of researchers and clinicians. Despite of relative rarity of severe class III problems in the general population, the impact of this deformity on the perceived quality of life is reflected in the number of individuals who seek treatment. It is understandable that many orthodontic and surgical methods have been recommended for the correction of this deformity.<sup>3,4</sup>

The corrective surgical procedures create new morphologic and functional relationships in order to diminish the facial deformity and to achieve the desired facial and dental outcomes.<sup>4,5</sup>

The functional and esthetic results of this treatments are strongly influenced by the soft tissues of the head and neck. Therefore, one of the most important goals in the treatment of any facial deformity, particularly of mandibular prognathism, is to ascertain an individuals available limits of soft tissue adaptation and the most desirable hard tissue – soft tissue relationship.<sup>1,2</sup> This underlines the need for detailed clinical estimation and cephalometric prediction of consequences related to facial soft tissue contours that will be caused by surgical correction.

## **Aim**

The aim of this cephalometric investigation was to establish, estimate and describe the effects produced upon the upper lip after the surgical correction of mandibular prognathism performed by sagittal split ramus osteotomy.

## **Material and methods**

The research was conducted on 115 patients of the Clinic for Maxillofacial Surgery, Faculty of Stomatology in Belgrade who were

hirurugiju Stomatološkog fakulteta u Beogradu učinjena korekcija mandibularnog prognatizma metodom sagitalnih klizajućih osteotomija po Dal Pontu.<sup>6</sup>

Osoba ženskog pola bilo je 71(61,7%), a muškog 44 (38,3%). Njihova prosečna starost iznosila je 23 godine. Najmlađi pacijent je imao 16 a najstariji 30 godina.

Svatom pacijentu su načinjena po dva profilna telerendgenograma glave, jedan pre operacije, a drugi šest meseci nakon uklanjanja imobilizacije.

Promene gornje usne su procenjivane na preoperativnim i postoperativnim telerendgenogramima merenjem i poređenjem sledećih varijabli:

- horizontalno (anteroposteriorno) pomeranje tačke **Sls** (sulcus labialis superior),
- vertikalno (kraniokaudalno) pomeranje tačke **Sls**,
- horizontalno (anteroposteriorno) pomeranje tačke **Ls** (labrale superius),
- vertikalno (kraniokaudalno) pomeranje tačke **Ls**.

Pomeranja tačaka **Sls** i **Ls** su vrednovana u koordinatnom sistemu determinisanom palatinalnom (bispinalnom) linijom i vertikalom povučenom kroz nju (slika 1):

- dužina gornje usne **Du** (najkraće rastojanje između linija povučenih kroz tačke **Sn** (subnasale) i **Sto** (stomion) koje su paralelne na bispinalnom linijom (slika 1),
- ugao **SN/Sls**,
- ugao **SN/Ls** (slika 2).

Stepen promena koštanih struktura odnosno distalnog pomeranja donje vilice praćen je pomoću promena parametra **IS** /incizalna stepenica/ (slika 3).

Statistička obrada vrednosti ispitivanih parametara je obuhvatila izračunavanje: srednjih vrednosti, standardnih devijacija, standardnih grešaka, minimalnih i maksimalnih vrednosti i intervala pouzdanosti za verovatnoću od 95%. Urađeno je i proporcionalno poređenje promena korišćenih parametara sa promenama incizalne stepenice.

## Rezultati i diskusija

Osnovne statističke vrednosti o horizontalnom (anteroposteriornom) i vertikalnom (kranio-kaudalnom) pomeranju korišćenih tačaka prikazane su u tabeli 1.

subject to surgical correction of mandibular prognathism using the sagittal split ramus osteotomy by Dal Pont.<sup>6</sup>

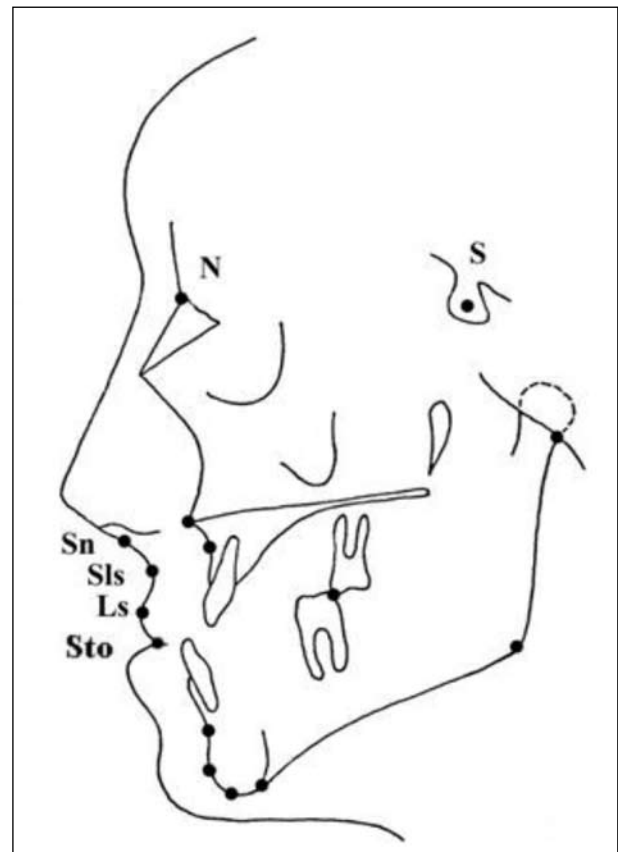
Seventyone of these patients (61.7%) were females and 44 (38.3%) were males. Their average age was 23 years. The youngest patient was 16 and the oldest 30 years of age.

Two lateral cephalometric radiographs were taken of each patient, the first one before the operation and the second one six month later, after removal of the immobilisation.

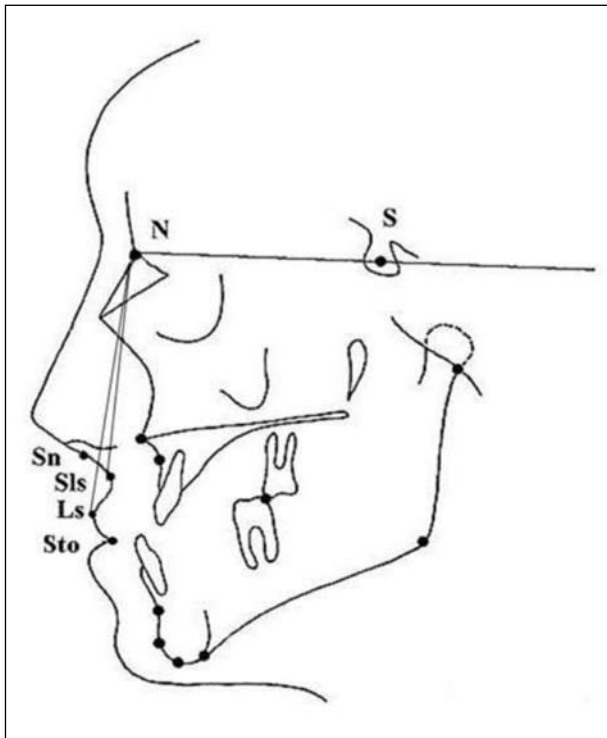
The changes of the upper lip were estimated on the pre-and post-operative cephalometric tracings by measuring and comparing the values of following linear and angular cephalometric parameters:

- Anterioposterior movement of the point **Sls** (sulcus labialis superior),
- Cranio-caudal movement of the point **Sls**,
- Anterioposterior movement of the point **Ls** (labrale superius),
- Cranio-caudal movement of the point **Ls**.

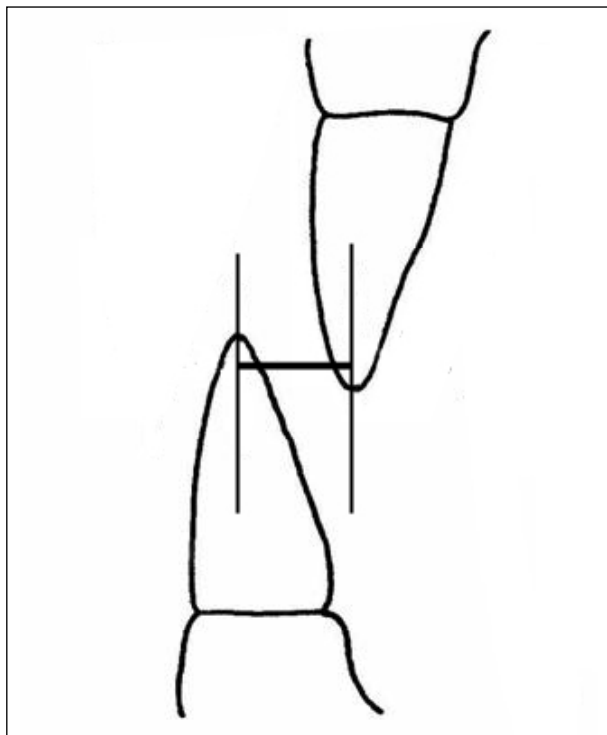
The measurements of these linear parameters were performed using the coordinate system determined by the palatinal (bi-spinal) line and a perpendicular line drawn upon it (figure 1):



Slika 1. Tačke na mekotkivnom profilu  
Figure 1. Points of the soft tissue profile



Slika 2. Angularni parametri  
Figure 2. Angular parameters



Slika 3. Incizalna stepenica  
Figure 3. The incisal step (overjet)

Tačka Sls se horizontalno ne pomera kod skoro polovine (47%), a tačka Ls kod skoro trećine operisanih (31,3%). Očigledno da se sulkus labialis superior i labrale superioris minimalno pomeraju. Interesantno je da je broj

- The length of the upper lip **Du** (the shortest distance between the lines paralell to the bi-spinal line and drawn through the points. **Sn** (subnasale) and **Sto** (stomion), (figure 1).

- The angle between the SN and Sls (**SN/Sls angle**),

- The angle between the SN and Ls (**SN/Ls angle**), (figure 2).

The mandibular repositionig (degree of mandibular set-back) was evaluated according to the changes in the length of the incisal step (overjet) **IS** (figure 3.).

Statistical appraisal of the values of examined parameters included the calculation of the means, standard deviations, standard errors, the minimal and maximal values and the confidence intervals for the probability levels of 95%. The proportional relations between the changes of the examined parameters after operation and the changes in the length of the incisal step were also calculated. In the other words, degree of surgical mandibular repositioning was compared with changes in the length and position of the upper lip.

### Results and discussion

The values of the horisontal (anterio-posterior) and vertical (cranio-caudal) movements of the points Sls and Ls after operation are shown in table 1.

The Sls point had no horisontal movement in almost a half ( 47% ), and the Ls point in almost a third (31.3%) of surgically treated patients. The anterio-poterior movement of these points was observed in a quite large number of surgically treated patients (17.4%). However, the changes in the position of sulcus labialis superior (Sls) and labrale superius (Ls) after operation seem to be minimal and insignificant (table 2).

These results point to complexity of the upper lip movement after correction of mandibular prognathism by means of sagittal osteotomies.<sup>7,8</sup>

Obviously, the compulsory position of the upper lip before surgical correction was dictated by the position of the lower lip and lower incisors. The specific compensatory spasm of the soft tissues, that is often present in persons with mandibular prognathism should be also taken into account.<sup>9</sup>

*Tabela 1. Osnovne statističke vrednosti o horizontalnom i vertikalnom pomeranju korišćenih tačaka*  
*Table 1. The values of the horizontal and vertical movements of the examined points after surgical correction*

| Linearni parametri<br>Linear parametres | mean | st.dev. | med. | min.  | max. | range |
|---|------|---------|------|-------|------|-------|
| Sls-hor.                                | 0.2  | 0.0     | 1.3  | - 4.0 | 3.0  | 7.0   |
| Sls-ver.                                | 0.8  | 0.0     | 1.8  | - 6.0 | 4.0  | 10.0  |
| Ls-hor.                                 | 1.2  | 1.0     | 1.9  | - 3.0 | 7.0  | 10.0  |
| Ls-ver.                                 | 1.3  | 1.0     | 2.0  | - 8.0 | 6.0  | 14.0  |

*Tabela 2. Distribucija ispitanika prema anteroposteriornom pomeranju ispitivanih parametara*  
*Table 2. Distribution of patients according to the anter-oposterior movements of the examined points*

|     | bez promene<br>without changes |      | do 1 mm<br>to 1 mm |      | napred<br>front |      | distalno<br>distal |      |
|-----|--------------------------------|------|--------------------|------|-----------------|------|--------------------|------|
|     | n                              | %    | n                  | %    | n               | %    | n                  | %    |
| Sls | 54                             | 47.0 | 37                 | 32.1 | 20              | 17.4 | 41                 | 35.7 |
| Ls  | 36                             | 31.3 | 24                 | 20.8 | 13              | 11.3 | 66                 | 57.5 |

onih kod kojih se te tačke pomeraju napred relativno velik 17,4% (tabela 2).

Ovakvi rezultati ukazuju na složenost pomeranja gornje usne posle korekcije mandibularnog prognatizma pomoću sagitalnih osteotomija.<sup>7,8</sup>

Izvesno je, da je prinudni položaj gornje usne pre operacije bio diktiran položajem donje usne i donjih sekutića. Ne treba zanemariti ni specifičan kompenzatorni grč mekotkivnih struktura, koji je često prisutan u osoba sa mandibularnim prognatizmom.<sup>9</sup>

Nesumljivo da distalizacija donje usne omogućava gornjoj mnogo slobodnije ponašanje i čini se da ona posle korekcije mandibularnog prognatizma dobija mnogo prirodniji položaj.

Vertikalna pomeranja korišćenih tačaka se odigravaju kod polovine ispitanika ovog istraživanja i češća su u kaudalnom, nego u kranialnom pravcu (tabela 3). To upućuje na zaključak da dolazi do opuštanja gornje usne i njenog izduživanja. Možda se može reći da je to posledica distalizacije donje usne i donjih sekutića i eliminisanja prinudnog položaja gornje usne koja je tim strukturama bila potisnuta kranijalno. Verovatno da je povećanje dužine

It is beyond any doubt that repositioning the lower lip together with mandibular set-back enables the upper lip to move in a much freer manner and to occupy a much more natural position.

The vertical movements of the analysed points took place in a half of the surgically treated patients. They were more often directed downwards than upwards (table 3). In the other words, after operation the upper lip of these patients looked more relaxed and elongated. This can be explained by distalisation of the lower lip and lower incisors after the mandibular set-back, as well as by elimination of the compulsory position of the upper lip that was pushed by these structures in the cranial direction. The elongation of the upper lip is probably followed by the reduction of the filtrum curve.

The changes of the angular parameters after surgical correction of mandibular prognathism are presented in tables 4 and 5.

According to the obtained results the SNSLs angle did not change in 75%, and the angle SNLs in 65% of the operated patients. However, it should be kept in mind that the an-

Tabela 3. Distribucija ispitanika prema kraniokaudalnom pomeranju ispitivanih parametara  
 Table 3. Distribution of patients according to the cranio-caudal movements of the examined points

|     | bez promene<br>without changes |      | do 1 mm<br>to 1 mm |      | kranijalno<br>cranial |      | kaudalno<br>caudal |      |
|-----|--------------------------------|------|--------------------|------|-----------------------|------|--------------------|------|
|     | n                              | %    | n                  | %    | n                     | %    | n                  | %    |
| Sls | 48                             | 41.7 | 22                 | 19.1 | 16                    | 13.9 | 51                 | 44.3 |
| Ls  | 44                             | 38.3 | 20                 | 17.4 | 9                     | 7.8  | 62                 | 53.9 |

Tabela 4. Vrednosti ispitivanih angularnih parametara  
 Table 4. The changes in the examined angular parameters after surgical correction (degrees)

| Angularni parametri<br>Angular parameters | mean | med. | st.dev. | min. | max. | range |
|---|------|------|---------|------|------|-------|
| SNSLs                                     | 0.4  | 0.0  | 1.2     | 4.0  | 3.0  | 7.0   |
| SNLs                                      | 1.2  | 1.0  | 1.6     | 5.0  | 4.0  | 9.0   |

Tabela 5. Distribucija ispitanika prema promenama uglova SNSLs i SNLs  
 Table 5. Distribution of patients according to the change of SNLs and SNL angles

|       | bez promena<br>without changes |      | do 1°<br>to 1° |      | povećan<br>increasing |      | smanjen<br>decreasing |      |
|-------|--------------------------------|------|----------------|------|-----------------------|------|-----------------------|------|
|       | n                              | %    | n              | %    | n                     | %    | n                     | %    |
| SNSLs | 37                             | 32.2 | 51             | 44.3 | 21                    | 18.3 | 57                    | 49.6 |
| SNLs  | 23                             | 20.0 | 39             | 39.9 | 14                    | 12.2 | 78                    | 67.8 |

gornje usne praćeno i smanjenjem krivine filtra.

Podaci o promenama ispitivanih angularnih parametara nakon hirurške korekcije, prikazani su na tabelama 4 i 5.

Može se zaključiti da se ugao SNSLs nije promenio kod 75%, a ugao SNLs kod 65% operisanih pacijenata. Ovakav zaključak se može doneti ako se prihvati stanovište da promene uglova do jednog stepena nemaju kliničkog značaja.

Ovakve promene ugaonih parametara su saglasne sa promenama korišćenih linearnih parametara i pokazuju da su promene na gornjoj usni minimalne ili gotovo beznačajne, što je u saglasnosti sa empirijskim zapažanjem.<sup>10-12</sup>

gular changes up to 1 degree are not clinically significant.

The minimal changes in the examined angular, as well as in linear parameters point to the minimal changes in the length and position of the upper lip after surgical correction of mandibular prognathism. These findings are in accordance with the empiric observations.<sup>10-12</sup>

The length of the upper lip increased in 87 (75.7%) of the operated patients and that was the only statistically significant change. Obviously, some minor changes of the upper lip profile also occurred as a consequence of the altered shape and rearrangement of the soft tissue structures. According to the results of this study and supported by most research

Dužina gornje usne se povećala kod 87 ili 75,7% operisanih pacijenata i to je jedina statistički značajna promena.

Očigledno je da minorne promene profila gornje usne nastaju takođe kao posledica izmena u obliku i preraspodeli mekotkivnih struktura. Od celokupne promene profila nastale korekcijom, gornjoj usni pripada oko 8%.

Kao što se i pre istraživanja očekivalo, a što je u saglasnosti i sa istraživanjima drugih autora, promene gornje usne su minimalne.<sup>11,13</sup>

Srednja vrednost promena incizalne stepenice (7,41 mm) direktno ukazuje na dužinu putanje središnjeg fragmenta iz preoperativnog u postoperativni položaj.<sup>14</sup>

Odnos pomeranja koštanih struktura donje vilice i gornje usne za uzorak ovog istraživanja iznosi 1 : 0,15. To praktično znači da se gornja usna pomera za 15% ukupnog pomeranja struktura donje vilice.

Zapaža se da promene na gornjoj usni, koje imaju statističku značajnost, imaju relativno male apsolutne vrednosti, značajne sa akademsko teorijskog aspekta, ali su mnogo manje važnosti za svakodnevni rad kliničara.

Nije prisutna namera da se i takve vrednosti zanemaruju, naprotiv saznanje o njima je potrebno, ali opreznost i određena kritičnost u njihovoj primeni je neophodna, jer ponekad, insistiranje na tako malim vrednostima može biti suvišan balast koji nema i praktično primenjiv aspekt.

## **Zaključak**

Promene gornje usne posle hirurške korekcije mandibularnog prognatizma pomoću sagitalnih klizajućih osteotomija grane donje vilice su minimalne i gotovo beznačajne.

Statistički je jedino značajna promena dužine gornje usne (povećala se) koja se odigrala kod  $\frac{3}{4}$  pacijenata ovog istraživanja.

Sve promene gornje usne su posledica promena položaja donjih sekutića i donje usne koje se dešavaju pod uticajem promena koštanih struktura.

Gornja usna se pomera za 15% ukupnog pomeranja struktura donje vilice.

literature, the changes in the upper lip after surgical correction of mandibular prognathism are minimal. It can be assumed that changes of the upper lip take about 8% of total changes of the facial profile after this operation.<sup>11,13</sup>

The average value of the incisal step change (7.41mm) indicates directly the length of the middle fragment trajectory from the pre-operative to the post-operative position.<sup>14</sup>

The relationship between the mandibular set-back and the movement of the upper lip in the examined sample was 1:0.15. This actually means that the upper lip movement amounted only 15% of the movement of the lower jaw structures.

It was also noticed that statistically significant changes in the upper lip had minor absolute values that are of theoretically-academic importance, but of only minor importance for the everyday clinical practice.

There is no intention to neglect these values, on the contrary, it is necessary to be aware of them. However, they should be applied with caution and criticism, because insisting on such minor values could become a burden that has no real-life significance.

## **Conclusions**

The upper lip changes after surgical correction of mandibular prognathism by means of sagittal split ramus osteotomy are minimal and almost insignificant.

The only statistically significant change is the increase in the length of the upper lip that occurred in 75% of patients included in this investigation.

All changes of the upper lip are the consequences of altered position of the lower incisors and the lower lip caused by surgical repositioning of the mandible.

The repositioning of the upper lip amounts approximately 15% of the complete repositioning of the lower jaw.

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