

## THE RESULTS OF SURGICAL ORTHODONTIC TREATMENT OF 70 PATIENTS WITH MAXILLARY COMPRESSION

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### SUMMARY

The report shares the results of the surgical and orthodontic treatment of 70 patients at the age of 13 to 37 with compression of maxilla, combined with different orthodontic deformities. The features of the surgical, as well of the orthodontic treatment separately of these patients are described.

**Key words:** maxillary expansion, surgical-orthodontic treatment

The surgical-orthodontic treatment of the maxillary compression is used by many authors (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15). Its major advantage compared to the orthodontic treatment itself is in the achievement of faster treatment results.

The existing in literature data on complex treatment of compression is incomplete. They define the role of the surgical preparation of the maxilla compared to a separate surgical method, and not the comparison and the recognition of different methods. There is no clear vision of the complex treatment of compression as a stage of the radical treatment of dental and maxillary deformities (DMD). This is why it is necessary to recognize the role of the different types of compactostheotomies and the incomplete osteotomies in the extension of the maxilla as a stage of the radical treatment of DMD. The examination and the treatment of the patients have been carried out in the Clinic for dental surgery and MFS and in the Department of orthodontics at the Dental medicine faculty – Sofia between 1987 and 1990.

The data from the surgical and orthodontic treatment we have implemented is shown in two separate tables.

The results of the surgical treatment are presented on Table 1. The allocation of the groups is based on the surgery technique used and the type of deformities. Oral antibiotic treatment has been used in all patients (2 gr of ampicilline qid orally) and just the third group has received gentamycin 2 x 80 mg i.m.

More complications have been observed in the second group of patients compared to the first one as well as higher level of bed occupancy (8.5 vs. 4 days). In our view this can be explained with the deeper penetration

within the bone – a trauma requiring longer monitoring at hospital.

The implemented post-surgery treatment in group one and group two shows that the general condition of the patients do improve after Day 4 following the operation. This concerns the local status (excluding patients with complications). In our view the mentioned regimen of medication treatment contributes to the faster clearance and suppression of the post-surgery edema.

The clinical monitoring of these patients requires 3-4 days; however this does not correspond to the results from the bed occupancy analysis (7 days). This is due not so much to the need of hospital monitoring, than the period of waiting for the device treatment resulting from the fact that many patients live away from the hospital center.

In summary of all above said it is clear that the rate of complications is small– just 4 patients, and the luxation of one tooth in one of the patients, which has led to its removal at a later stage. In the rest of the patients the observed complications (two massive haematomas and one hemorrhage) have been put under control and led to no permanent sequels.

The compactostheotomy and the incomplete osteotomy had wide scope of application in surgical preparation and do not lead to permanent complications, irrespective of the fact whether applied on the vestibulum or on the palate. The monitoring of the patients requires a long period of hospitalization.

The surgical interventions mention up to here are supportive and their reporting without taking into account the data from the orthodontic treatment is as an end in itself.

The results of the orthodontic treatment are presented on Table 2. The interpretation of the first 4 columns has been done taking into account Table 1. The application of the devices (on Day 10 on average) in all three groups aims at better adaptation of the palate mucous due to the better effect on the healing process by the direct jam of the periost to the underlying tissues.

The activation of the device in week three was in conformity with the necrobiotic phase described by Tittova - 1975.

The resorption and the apposing of the bone are better directed in the created young bone tissue.

The duration of the orthodontic treatment applied in the first group of patients was one year three months, and in the second – twelve months, while for the third one it was eight months and a half. This period of treatment of the patients from the third group was in conformity with the planning of the further mandibular reconstruction. For the patients of the second group the average time for treatment was prolonged compared to the third group, presuming on the better bone re-allocation in the maxilla, creating a better correlation as compared to the third group. The first group of patients has the longest duration of treatment compared to the other two due to its clinical characteristics that has been overcome only through the methodology of the complex surgical-orthodontic treatment. The highest percentage of patients with difficulties in nasal breathing is in the third group, followed by the first and the smallest being in the second group. This clinical finding suggests that an insufficiency in the development of one sector (the maxilla) in the orofacial system leads to the overdevelopment of another (the mandibula).

The recorded transversal result in the first group (5mm) has led to a sagittal re-allocation of the premaxillar (with 1mm). This explains the fact that in case of expansion of the maxilla sagittal movements of the jaw can occur. The results achieved in the second group in transversal direction are equal to 6mm. The sagittal reallocation of 3mm in this group has been the result of the distalization of the front teeth under the effect of the vestibular arc.

The results in the third group are nearly equal to those of the first group, both in transversal and sagittal respect.

From all above said it becomes clear that the orthodontic treatment yields good results. They are due mainly to the surgical preparation applied, that makes the maxillary bone close to the one the childish jaws and makes it more plastic. It is worth mentioning for this group that the highest results achieved in transversal direction for the second group of patients (in class II deformities) compression with protrusion is due to the integration of the bone from the pre-maxillary to the more posterior parts of the upper jaw (maxilla).

Besides in some of the patients we have observed an extension of the lower arc with it being affected by any orthodontic powers. Such an example is the following patient.

The patient EDE, 23 years old (reg. No. 1365) has been admitted for the first time in the clinic on November 1, 1988 and presented with complaints of incorrect bite. Following a consultation with a dentist she has been referred to the clinic for amendment of the bite. She has mentioned no functional disturbances. During the examination it was found that the maxilla protrudes as

compared to the mandibula. The extraoral status shows a medialization of the upper front with lack of contact between the upper and lower lip at rest and substantially deepened mental flap. The intraoral status shows lack of contact between the lower and upper frontal teeth with substantial protrusion of the upper front and a distal bite.

The orthodontic analysis of the models shows one compression (of 1mm) in the right half of the maxilla and an expansion in its left half. Such expansion is registered in all parts of the mandibula. The examination of the front length of the maxilla shows its overdevelopment with + 4 mm over normal. There is a diasthema and thremas in the front. Following the paraclinical tests the patient has been admitted to the clinic with the diagnosis of prognathia and compression maxillae and a distal bite.

An incomplete osteotomy in the area of the maxilla (in front and both sides), both mandibularly and vestibularly, was done under local anesthesia. After five days of medication with antibiotics and vitamins the stitches have been removed and the patient was discharged clinically healthy.

On the 12-th day following operation a palatal plate has been inserted and an activation of the screw began once in three days. After seven months of orthodontic treatment a four millimeter extension has been achieved in the front and rare width of the maxilla and three millimeters of retrusion of the upper front. The impressive fact with this patient is the resulting extension of 1,5mm in the front and rare part of the mandibula without it being treated orthodontically in any way. In our view this is a result of the occlusive pressure of the extended upper arc. The results of the surgical-orthodontic treatment at this stage have been followed by the implementation of a retention device for preserving them.

Following five months of retention the second stage of the treatment has been planned. As she insisted, she has been admitted to the clinic again and following full tests a front maxillary osteotomy has been performed in order to get a full contact in the frontal area. Following 15 day treatment in the clinic the patient has been discharged clinically healthy with the recommendation for follow-up checks in view of the implemented intermaxillary fixation. After two months of intra-jaw fixation it has been removed and ontrol impression have been taken after this stage; they showed a relapse of 2mm from the resulting extension in the maxilla, while in the mandibula the relapse was just 0,5mm.

In conclusion we can say that an extension of the lower arc can be achieved under the new occlusion pressure of the upper arc. The closing of diasthemas and thremas is achieved under the effect of the ligatures from the intermaxillary fixation.

All the stages of the treatment of these patients are documented via plaster casts.

The reallocation of the apical basis was lowest in the first group – 1,5mm, followed by the second – 2mm and the highest in the third group – 2,5mm.

these three different orthopedic reallocations in the bone skeleton are due, in our view, to the different depth and width of the surgical preparation, while the resulting highest reallocations in the third group of patients with Le Fort I – corticotomy and intermaxillary separation show that in the extension of the maxilla the major source of resistance are the peri-maxillary sutures.

The retention of the results achieved is just a half of the treatment process. For this reason we have prepared for each patient one retention device. The average retention of treatment for the patients in the first group was 8 months, for the patients in the second group – 5, while for the patients of the third group it was the smallest – 4 months and a half. These short durations of retention resulted to a relapse in two patients from the first group, one from the second group and four from the third group. This small percentage of relapse has at least two explanations. The first is that the compactostheotomy and the incomplete osteotomy are biological procedures; second that the splints and the intermaxillary fixation have been placed in 40 of the patients due to maxillary reconstructions, while the remaining part of the patients (23) had a partial relapse (1mm) compared to the patients with a splint.

The application of a mucoperiosthomy in 15 patients, with 9 of them undergone surgery (general reconstruction plus following splinting with intramaxillary fixation) would mislead us in view of the reporting of its role in the efforts against relapse. Thus based on the results achieved we believe that this manipulation is not for patients that are about to undergo an intermaxillary fixation, in order to be able to give a make evaluation of the results defined.

The objective question here is whether the results would be better if more complicated techniques have been applied and is it not unconscionable to continue with this simple technique? This can hardly be the case. A more complicated surgical procedure would lead, from one side, to higher risks and complications; while on the other side would depreciate the role of the orthodontic treatment where the surgical treatment in itself is not efficient.

The examination of the patients for orthodontic surgery both by the orthodontist and the surgeon as an important step in the treatment of patients with DMD was done by West in 1981. The scheme of the author (fig.1) in this sense (the first for items plus item seven) – does not fully correspond to the problem under our discussion. This is why we supplement it (with items five, six and eight), so that it can respond to the current routine requirements for collaboration, and also to the treatment of compression in the radical treatment approach in DMD.

Patient  
Diagnosis  
Treatment target  
Treatment plan  
Treatment options

ORTHODONT

SURGEON

Duration and possible complications  
Response from patient  
Treatment  
Treatment outcome

Fig. 1

It is also worth discussing the fact that in patients with difficulties in nasal breathing during the operation in seven patients we found a strong sinosthosis of the intermaxillary suture, elevated as a crista about one millimeter above and around the suture. The decortications of this bone both above and along the suture were followed by similar of the anterior nasal spina while subsequently it was entered with an osteotomata with the help of several hammer strokes. This manipulation would lead to a faster improvement of the nasal breathing. From all above said we suggest that the major area of development of the premaxillary and the  $\mu$  above positioned pear-like orifice is anterior nasal spina and intermaxillary suture. The strong ossification of this area is in result of the difficult breathing (nasal breathing). Due to this the third group of patients, where this manipulation has been applied, and the highest results are from the extension of the apical base. The strong correlation found and the regression in the anthropologic examinations between the apical base of the maxilla and the pear-like orifice is a fact that makes us think that the opening of suture intermaxillaris leads to improved nasal breathing. The following patient is an example of this kind.

The patient S.I.S. from Pernik, 17 years old (reg. No. 607) has been first admitted to the clinic on April 14, 1989 with complaints of difficult bite and esthetic disturbance due to incorrect bite. After a consulting examination with a dentist he has been referred to the orthodontics clinic, and from there – to the clinic for complex treatment.

The extraoral status shows an upright mandibular angle, medialized mandibula, lack of naso-labial flaps and negative mouth scale.

The intraoral status shows a medialized mandibula, lack of contact (in occlusion) between the lower and upper front teeth and cross bite on the sides.

The orthodontic analysis of the models shows an axial rotation of I I, a shifted towards the palate 2 and vestibuloposition of the right canine, plus a compression (of 2mm) in the back right part of the maxilla. While in the other parts of the maxilla have an expansion about and over + 2mm

compared to normal. The examination of the front length of the maxilla shows an overdevelopment (with + 1,5mm). The picture of the mandibula is a little different in view of the more pronounced expansion in both the front (+ 4mm), and the back (+ 7mm) part. This is also valid for their halves. The front length of this maxilla is overdeveloped with + 2,5mm over normal.

The analysis of the occlusion proves the existence of a progeny with crossed bite on the sides. While moving the plaster models from Class I I I to Class I (i.e. in the desired following the surgical occlusion) irrespective of the registered of the maxilla (+ 2mm) it is visible that a compression of the maxilla versus the mandibula still exists. In our view this corresponds to the approved by the Americans diagnosis of maxillary insufficiency where an extension of the maxilla is implemented instead of narrowing of the mandibula.

Following the paraclinical tests the patient has been admitted for treatment in the clinic. Under neuroleptic anesthesia with local anesthesia, a Le Fort I corticothomy was performed with separation in the area of intermaxillar suture, but without dividing the prerygoideus processus. After 4 days of hospital treatment and antibiotic coverage following an approved regimen the patient has been discharged with the recommendation to come for follow-up check on the seventh day – then the stitches have been removed.

On Day 15 following the operation a palate plate was inserted and the activation of the screw has begun once in three days.

After 9 months of orthodontic treatment with interruptions I I and 2 and 3 have been corrected and brought to normal. In the anterior part of the maxilla an extension has been achieved (equal to 3.5mm), such an extension (of 3.5mm) has been achieved in the posterior part of the jaw and in the anterior length a development has been recorded (of + 1mm). All these results have led to the overdevelopment of the

maxilla irrespective of the existing expansion before the treatment, but this overdevelopment had no effect on the mandibula.

After 8 months retention osteotomy of the mandibula was performed. The models taken before the surgery show a relapse of 0.5mm.

From all above said we can draw the conclusion that in grown patients subject to surgical-orthodontical extension the maxilla should always be overextended with about +1 to +2mm above the expected result.

All stages from the treatment of this patient have been visualized on plaster models.

In summary we can say that the insignificant and transient complications from the surgery form the ground to recommend their wide application. We also have to note the fact that the final reporting of the results of the surgical treatment is as an end in itself if it is not done in conformity with the orthodontic results.

The best extension of the maxilla is achieved via compression, combined with a protrusion (Class II). The established regression between the apical base of the maxilla and the pear-like orifice in the anthropological part prove the improved nasal breathing in extended apical base. This result, combined with the clinical data from the patients gives us the right to conclude that the surgical-orthodontic extension improves the nasal breathing.

The major forces behind the overcoming of the surgical-orthodontic extension of the maxilla are the peri-maxillary sutures. The splinting and the intermaxillary fixation reduce the rate of the post-treatment relapse.

The average data from the treatment reported (5–6mm of extension) form the ground of our recommendation that in grown up individuals (the average age of the patients  $x = 20.4$  months) a surgical-orthodontical extension of the maxilla has to be performed when treating the compression.

**Table 1.** Basement characteristics of the result of the ortodontical treatment

| Total patients | Male | Female | Starting treatment | Time of treatment | Transversal movement | Sagital movement | Apical base | Retention  | Recidive |
|----------------|------|--------|--------------------|-------------------|----------------------|------------------|-------------|------------|----------|
| 19             | 8    | 11     | 7-12 days          | 13 months         | 5 + - 1 mm           | 1 mm→<br>15 mm←  | 1.5 mm      | 8 months   | 2        |
| 23             | 7    | 16     | 9-13 days          | 12 months         | 6 + - 1 mm           | 3 mm←            | 3 mm        | 4,5 months | 1        |
| 28             | 9    | 19     | 8-15 days          | 8,5 months        | 5 + - 1 mm           | 15 mm→<br>1 mm←  | 25 mm       | 6 months   | 4        |

**Table 2.** Basement characteristics of the surgical treatment

| Groups      | Total patients | Male | Female | Use surgical interventions | Complications | Mucoperiostotomy | Medical treatment | Time spending in the clinic (days) |
|-------------|----------------|------|--------|----------------------------|---------------|------------------|-------------------|------------------------------------|
| I (class)   | 19             | 8    | 11     | 1019                       |               | 5                | Per os            | 4 days                             |
| II (class)  | 23             | 7    | 16     | 818                        | 2 patients    | 5                | Per os            | 8,5 days                           |
| III (class) | 28             | 9    | 19     | 28                         | 2 patients    |                  | Per os + i.m.     | 6 days                             |

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