F. K. Dzalaeva

FULL MOUTH REHABILITATION. COMPARISON OF METHODS. CLINICAL FINDINGS

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Full mouth rehabilitation. Comparison of methods. Clinical findings

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For dentists of all profiles, teachers of dental school and Universities, postgraduate students, practical dentists, practical dental technicians and doctors.

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Introduction

The concept of an interdisciplinary approach to the treatment of patients with adentia who need a complete reconstruction of the dentition is a pathogenetically substantiated and clinically effective direction of treatment, based on the need to take into account the anatomical and physiological characteristics of the dentoalveolar system in the course of complex planning and treatment of this category of patients.

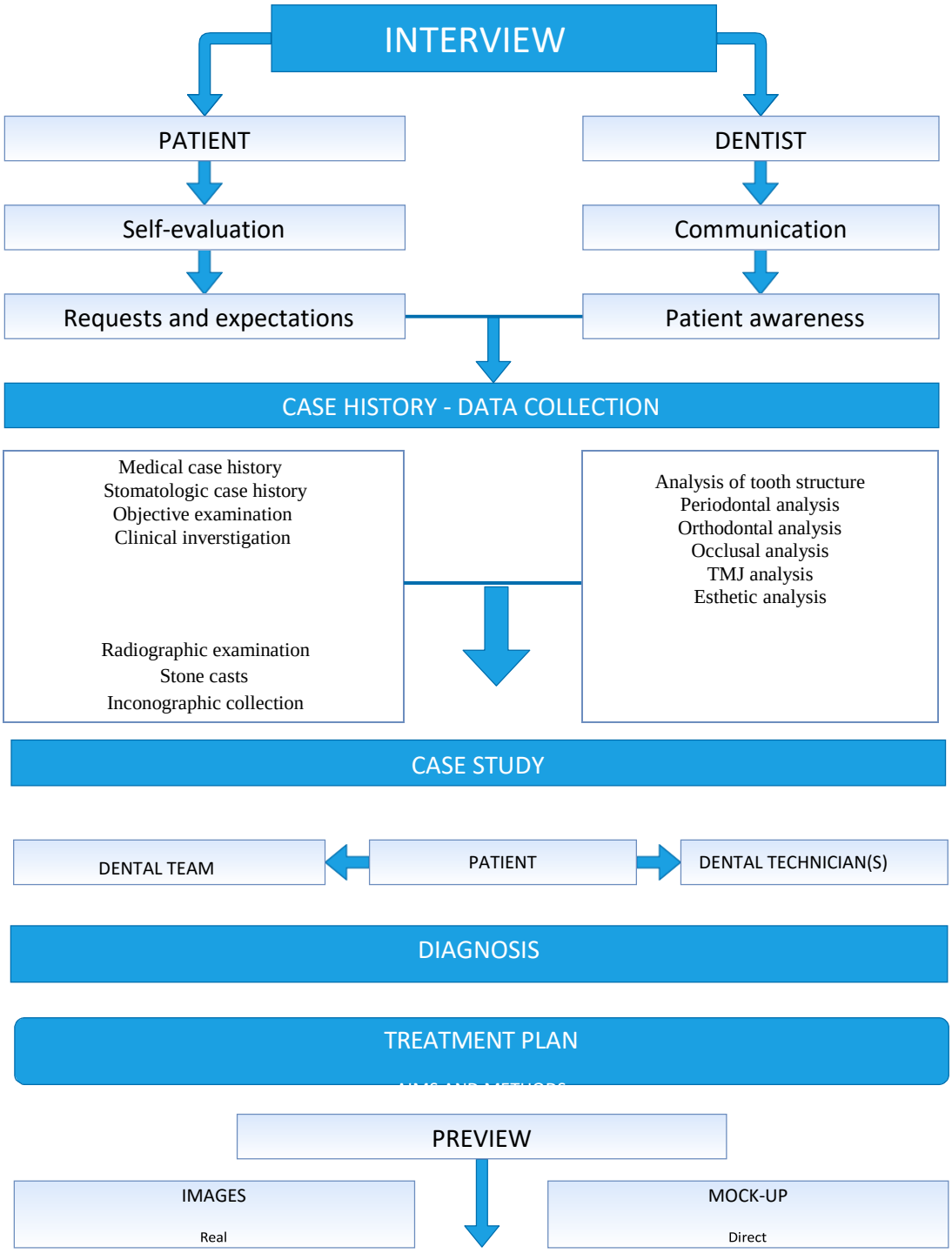
The use of the complex of therapeutic and rehabilitation measures proposed and tested in the work contributes to the fact that For the patients who undergo a complete reconstruction of the dentition, there are statistically significantly lower (relative to the comparison group) levels of pain severity during palpation of the muscles of the maxillofacial area, a decrease the severity of signs of the pathology of the state of the temporomandibular joint and the normalization of the characteristics of occlusion.

The use of an interdisciplinary approach to the treatment of patients with adentia who need a complete reconstruction of the dentition contributes to an expressed improvement in the aesthetic characteristics of the maxillofacial area (indicators of facial analysis, ratios of teeth and lips, dental analysis).

The implementation of the proposed approach to the implementation of dental orthopedic rehabilitation measures helps to reduce the manifestations of concomitant pathology in this group of patients (sleep characteristics, manifestations of OSAS), improve their quality of life and satisfaction with changes in appearance as a result of the treatment.

The complex of diagnostics and examination of patients with adentia in need of complete reconstruction of the dentition should include interdisciplinary studies, including an assessment of the state of the musculoskeletal system, a polysomnological examination of the patient and the study of sleep characteristics, the study of neurological and psychological status, an assessment of the quality of life patient, as well as consultations with related specialists.

Figure 1 shows the algorithm for the initial examination of an edentulous patient in need of a total reconstruction of the dentition.



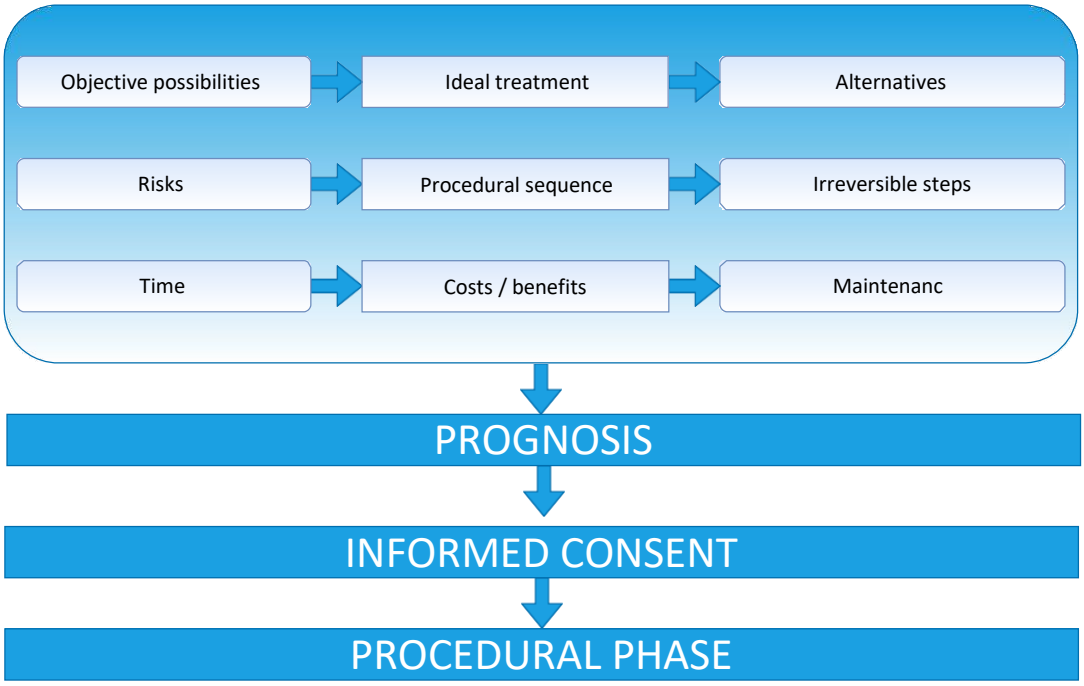

Objective possibilities
Ideal treatment
Alternatives
Risks
Procedural sequence
Irreversible steps
Time
Costs / benefits
Maintenanc
PROGNOSIS
INFORMED CONSENT
PROCEDURAL PHASE

Figure.1 Algorithm for preliminary examination of the patient

Methods of treatment and rehabilitation of patients

Orthopedic treatment was carried out with a standard set of measures was used, while taking into account the average anatomical characteristics of the patient, while installing fixed all-ceramic crowns without taking into account the individual characteristics of the patient.

Therapeutic and rehabilitation measures included the implementation of total restorations, taking into account the results of functional diagnostics and aesthetic indicators.

In other patients' treatment and rehabilitation measures were carried out on the basis of the principles of an interdisciplinary approach developed by us. As part of the implementation of this system, when planning bite correction, the data of an objective examination of patients were taken into account, including the central ratio, therapeutic position, individual hinge-orbital axis, occlusal plane, inclination of the central incisors, bite height. The indicators were evaluated, which were obtained using a complex of diagnostic methods to assess the state of both the dentition and other body systems (respiratory, central nervous, cardiovascular, respiratory, musculoskeletal).

Table 1 presents the stages of orthopedic rehabilitation of patients, including the diagnosis and complete reconstruction of the dentition based on the individual anatomical, functional and clinical characteristics of the temporomandibular joint.

Table 1

Stages of orthopedic rehabilitation of patients in need of complete reconstruction of the dentition.

№	Stages of rehabilitation	Methods of diagnosis and treatment
1.	Clinical Functional Analysis	Medical history Muscle palpation

		Brookschecker Occlusion chart Dental history Analysis of models
2.	Clinical instrumental analysis	Condylography Cephalometric analysis Analysis of models in the central relation of the jaws CPM Variator-> MPI (Mandibular position indicator)
3.	Instrumental diagnostics using imaging methods	1) Cone beam computed tomography 2) MRI TMJ 3) Orthopantomogram + CT scan of the upper and lower jaws
4.	Splint therapy	
5.	Plastering models into an articulator	
6.	Repeated control of condylography and cephalometry	
7.	Wax modeling of teeth	
8.	Installation of long-term temporary crowns	
9.	Installation of implants	
10.	Fabrication of definitive restorations	
11.	Monitoring the results of treatment	Condylography and cephalometry Analysis of models Brookschecker Occlusion chart Muscle palpation

To ensure the stability of the dentition, the method of selective grinding of hard dental tissues, temporary and permanent splinting, and ceramic restorations in a new therapeutic position were used. Long-term temporary crowns were used.

During the implementation of the proposed approach, when planning treatment, the anatomical and functional characteristics of the dentoalveolar system are studied, with special attention paid to the assessment of the TMJ function.

When studying the anamnesis of patients, the main errors of prosthetics for the patients with the need for total restorations of the dentition are identified and analyzed, and the causes of complications of orthopedic treatment are clarified. Consultations of related specialists (otorhinolaryngologist, neurologist, psychologist, speech therapist, osteopath, cosmetologist) are held.

The results of the aesthetic, clinical, functional and instrumental analysis performed during the diagnostics using the methods of condylography and cephalometry made it possible to determine the central ratio of the jaws when the models were mounted into the articulator. At the same time, an algorithm for working with the Gamma Dental program was used, which allows for occlusion modeling in VTO. An interdisciplinary approach allowed us, when planning an orthopedic, to take into account and timely correct functional and aesthetic disorders associated with malocclusion for the patients undergoing total restoration.

The treatment was carried out with the help of non-removable ceramic restorations of the dentition. Modeling and fabrication of structures was carried out using individual Gamma articulators, the advantages of which are casting along an individual hinge axis, measuring the occlusal plane, and assessing gamma rotation. The wax modeling performed in this case with sequential opening allows obtaining high functional and esthetic results of orthopedic rehabilitation of patients in need of total restoration of the dentition.

At the same time, an optimal distribution of loads on the dentoalveolar system is achieved, the risk of chipping of the facing material is reduced, and oral hygiene is also improved.

Case №1

Date of birth: 1966

Date of examination: 2010

Main concern:

- Edge to edge contacts in frontal part
- Interincisal angle decreased
- Gum recession
- Abfractions

Intraoral photos

Pic. 1-6. Intraoral photos

Left side - II class occlusion

Right side - III class occlusion

List of problems

- Upper and lower arches discrepancy
- No anterior guidance and canine control
- Speech problems
- Chewing problems
- Esthetic problems

Diagnosis

- Sagittal and transversal discrepancy
- Cusp to cusp occlusion in frontal area.

Treatment objectives

- Posterior support
- Canine control and anterior guidance
- Sagittal and transversal correction of dental arches
- Change OPI and angle of disocclusion

Treatment plan

- Myopathic splint fabrication with verticalization to 4 mm
- Remounting the cast
- Wax-up or orthodontic treatment
- Templates for implants placing
- Prosthetic

Findings Initial Diagnostics

Table №1

Special Medical Analysis			
Do you have or did ever have an illness with regard to point 1-12?			
		Yes	No
1.	Infections		X
2.	Cardo-vascular systems		X
3.	Respiratory system		X
4.	Digestive system		
5.	Metabolic system	X	
6.	Allergies – antibiotics teracycline		
7.	Urogenital problems		X
8.	Central nervous system		X
9.	Psychological problems (therapy)		X
10.	Rheumatic disease	X	
11.	Hormonal disease		X
12.	Special problems - posture		
Main concern: clicking joint, both sides, crepitation (right joint), headache			

Dental History Analysis		Valuation	Yes	No
1.	Do you have problems when you chew?			
2.	Do you have problems when you are talking?			
3.	Do you have problems in closing your teeth property?			
4.	Are any of your teeth especially sensitive?			
5.	Do you have problem when you open your mouthvery wide?			
6.	Do your jaw joints make noise and if so, on whatside?			
7.	Do you have pain in the area of your jaw joints?			
8.	Do you suffer from headaches?			
9.	Do you suffer from cramps or spasm in your head,neck or throat?			
10.	Do you have in general problems with your posture?			
	Occlusal Index			
11.	Have you ever had serious accident?			
12.	Did you have one or more oral intubations?			
13.	Have you ever had orthodontic treatment or …			
14.	Have you had a treatment with splint?			
15.	Are you grinding or pressing with your teeth?			
16.	Do you think that treatment is necessary?			
17.	Do you think that there is a serious disorder or illness?			
18.	When the last time you had dental treatment and what was done?			
19.	How would you describe your psychic behavior?			

happy	sad	calm	excited	self-controlled	lack of self-control

Table №2

Muscle Diagnosis		Right		Left	
		+	++	+	++
1.	Shoulders and neck				
2.	Atlanto-occipital region				
3.a	M.temporalis ant.				
3.b	M.temporalis med.				
3.c	M.temporalis post.				
4.a	M.masseter (superficial)	X			X
4.b	M.masseter (deep)			X	
5.	Tuber maxillae				
6.	M.pterygoideus medialis		X		X
7.	M.mylohyideus	X			X
8.	M.digastricus		X		
9.	Suprahyoidale M.				
10.	Infrahyoidale M.				
11.	Larynx				
12.	M.sterno-cleido-mastoideus	X			
13.	M.omohyoideus				X
14.	Tongue				
15.	Comparative palpation of jawjoints*				
	a) Lateral poles, statically		X		
	b) Lateral poles, in rotation		X		
	c) Retral joint space		X		
	d) Lig.temporo-mandibulare		X		X

Muscle palpation

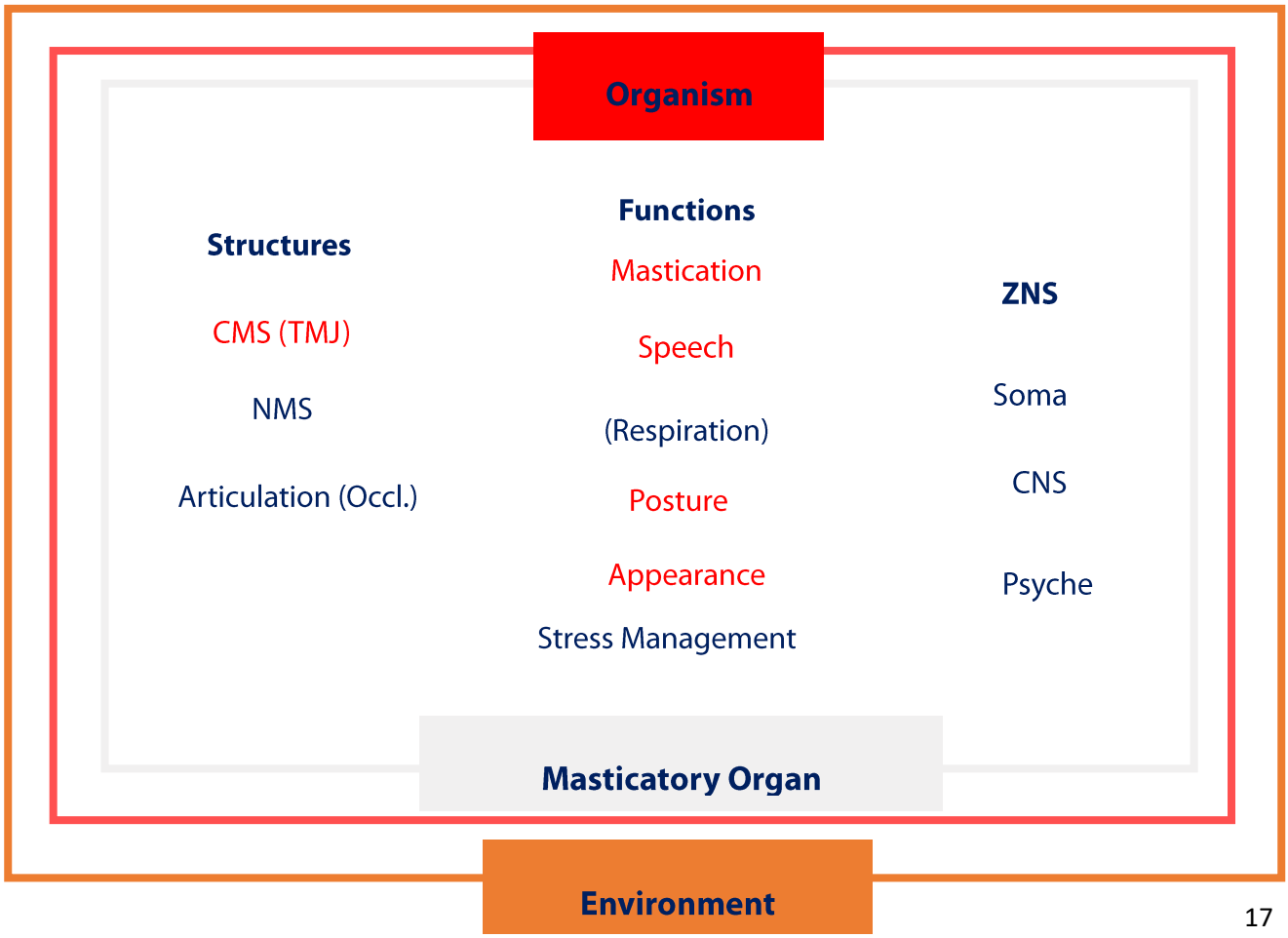
Muscle movements

Table №3

Sets of muscles:	
Muscles palpation	
Posture	1,2,7,12,13,14
Jaw-closing	3a, 3b, 4a, 4b, 5
Jaw-opening / protrusion	8, 9, 10
Retraction	3c, 8
Medio- / Laterotraction	6, 3a, 4a
Sublingual bone position	8, 9,10,11,13
Function	7, 8,9,10,11,14
Joint position Joint Structure, Capsule,Ligaments,Bilaminar zone, M.pterygoideus lateralis, Superior head	15

Cybernetic System of the Masticatory Organ

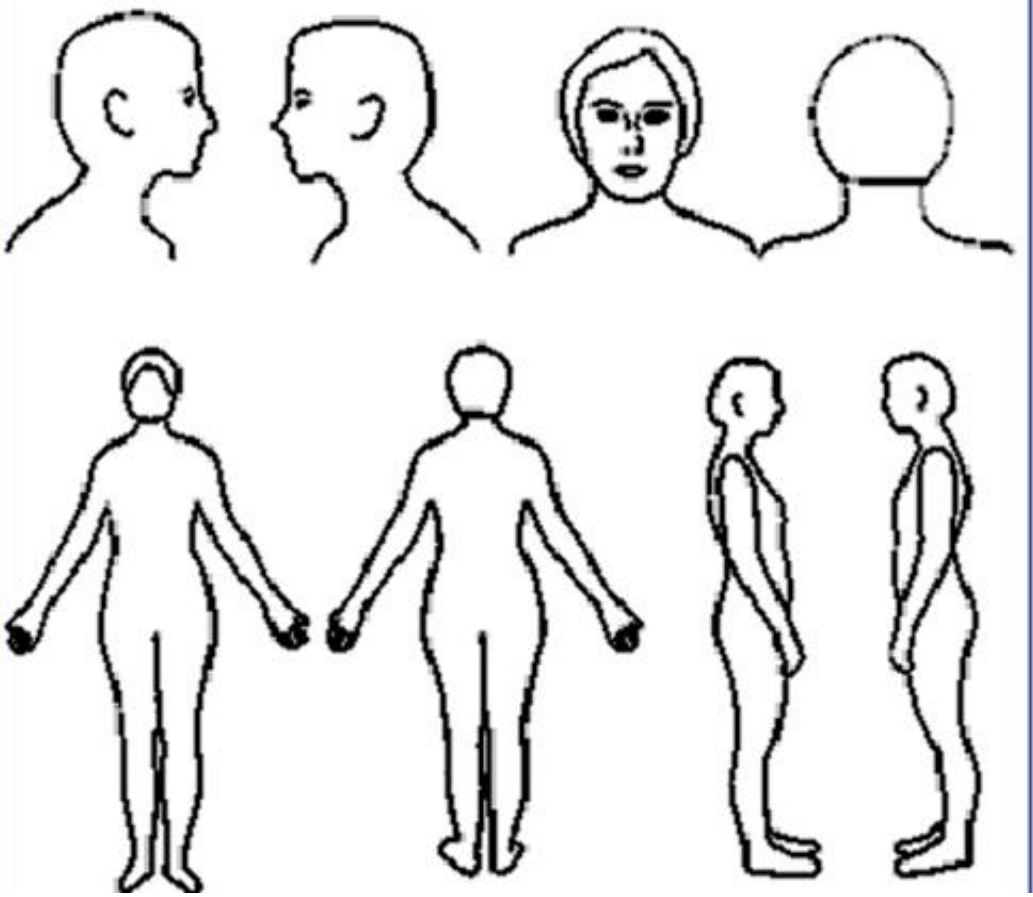
Table №4



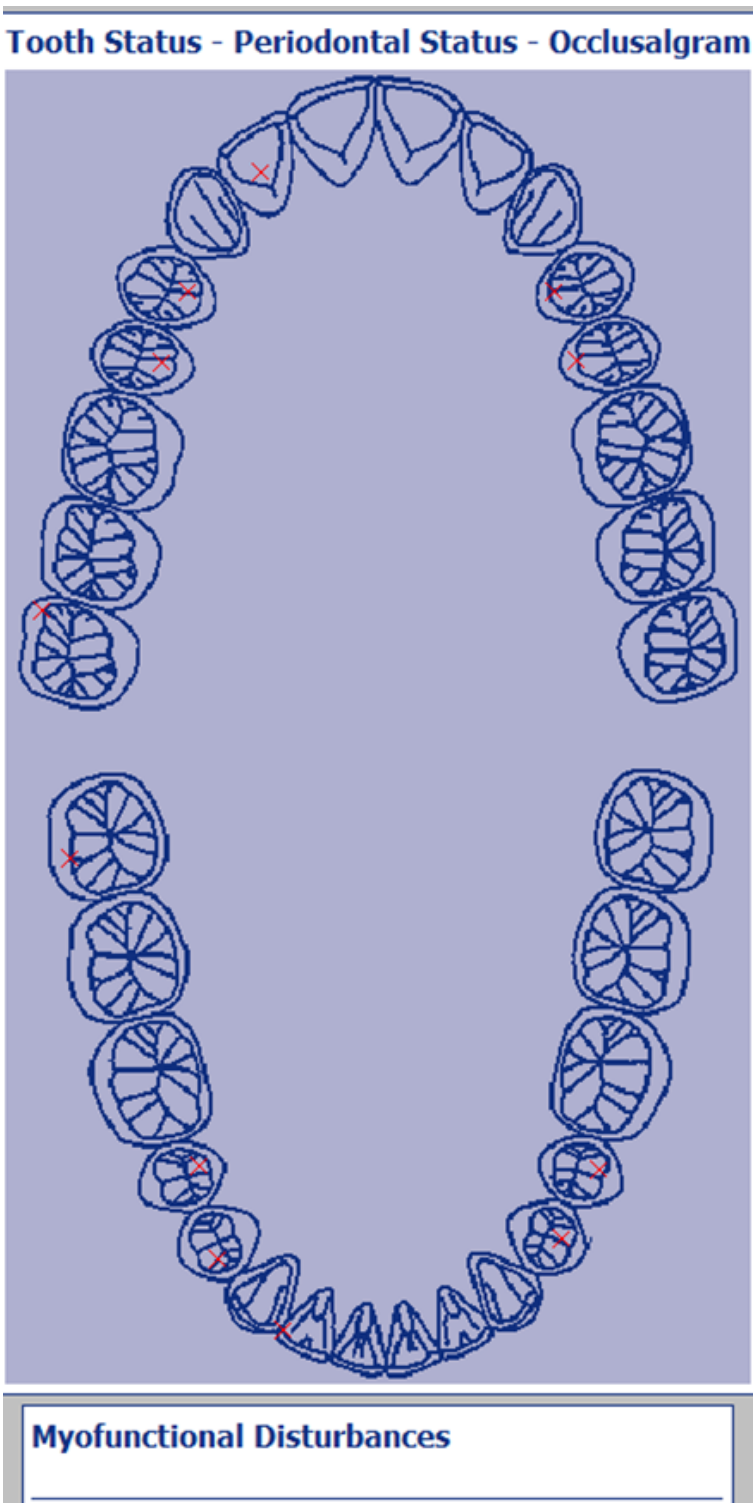
Preliminary Brainstem Nerve Analysis

1. N.olfactorius (analysis)
2. N.opticus (analysis)
3. N.oculo-motorius (clinical mobility)
4. N.trochlearis (clinical mobility)
5. N.trigeminus (clinical palpation and sensitiveness)
6. N.abducens (clinical mobility)
7. N.facialis (clinical mobility)
8. N.stato-acusticus (clinical check of equilibrium and hearing)
9. N.glosso-pharyngeus (clinical and analysis)
10. N.vagus (analysis)
11. N.accessorius (clinical and analysis)
12. N.hypoglossus (clinical and analysis)

Chronic pain

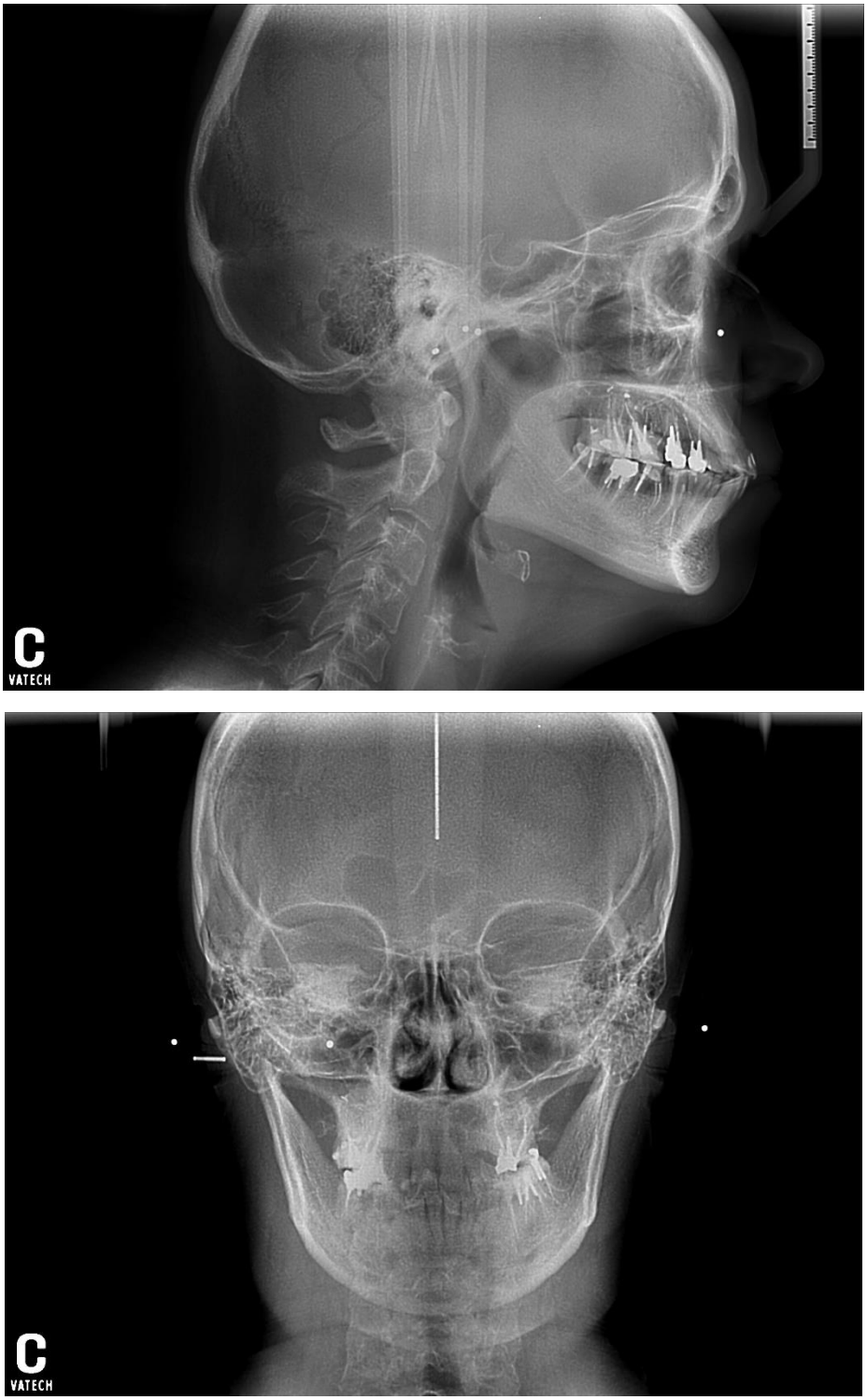


Pic. 7. Preliminary brainstem nerve analysis



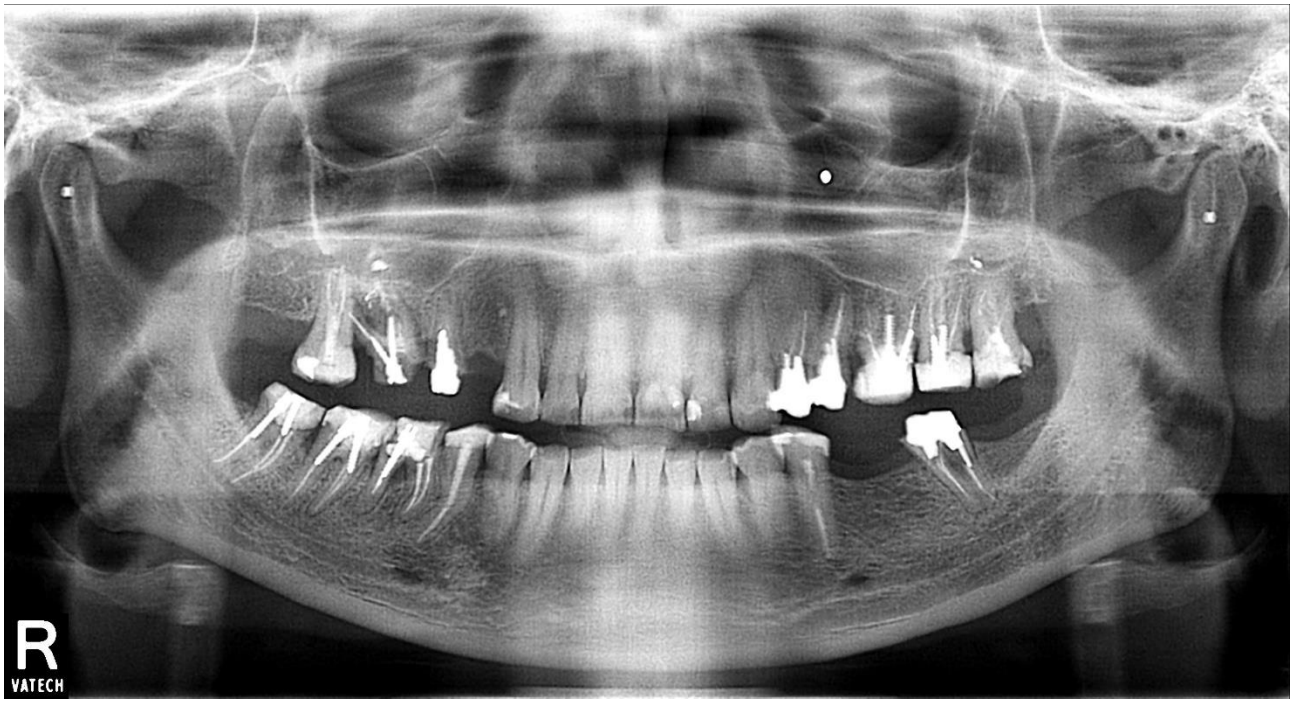
Pic. 8. Occlusalgram

Lateral X ray



Pic. 9-10. Lateral X ray

Orthopantomography



Pic. 11. Orthopantomography

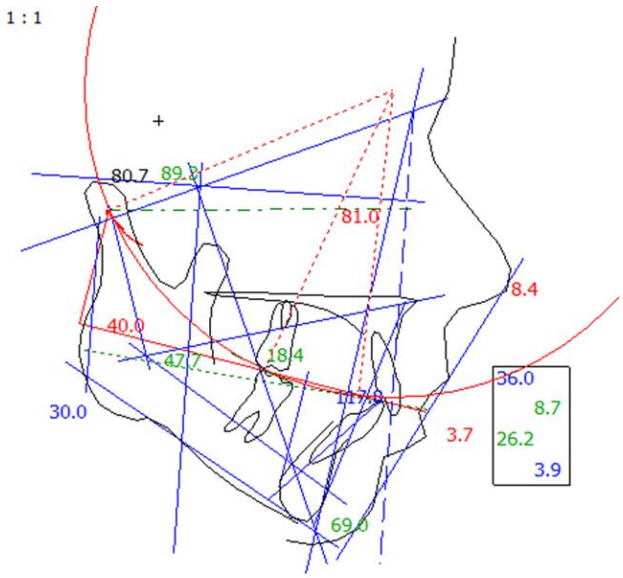
Cone-beam CT

Result: Teeth 17,16,15,24,25,26,27,37,46,47 must be extracted

Cephalometric analyses

Table №5

Slavicek Analysis			
Skeletal Measurement	Norm	Value	Trend
Facial Axis	90.0°	93.0	1B*
Facial Depth	89.0°	82.9	2-**
Mandibular Plane	24.0°	28.8	1D*
Facial Taper	68.0°	68.1	
Mandibular Arc	29.0°	39.9	2B**
Maxillary Position	65.0°	74.7	3+***
Convexity	0.00 mm	7.1	3X***
Lower Facial Height (by R. Slavicek)	45.2°	43.4	
Lower Facial Height to Point D	51.7°	46.3	1-*
Dental Measurement	Norm	Value	Trend
Interincisal Angle	132.8°	105.7	2-**
Upper Incisor Protrusion	4.3 mm	5.4	
Upper Incisor Inclination	23.1°	43.6	3+***
Upper Incisor Vertical	mm	0.9	
Lower Incisor Protrusion	1.0 mm	2.4	
Lower Incisor Inclination	24.1°	27.9	
Upper Molar Position	18.0 mm	20.3	1+*
Occlusal Plane	Norm	Value	Trend
Occlusal Plane – Axis Orbital Plane (Slavicek)	----°	6.2	
Idealized Occlusal Plane – Axis Orbital Plane	----°	6.4	
Distance Occlusal Plane – Axis (DPO)	40.9 mm	33.1	
Radius of Curve of Spee	---- mm	89.3	
Lip Embrasure	0.0 mm	1.0	
Occlusal Plane Xi Distance	-1.4 mm	0.8	
Functional Measurement	Norm	Value	Trend
Horizontal Condylar Inclination right	----°	48.8	
Horizontal Condylar Inclination left	----°	46.8	
Horizontal Condylar Inclination	----°	47.8	
Relative Condylar Inclination	----°	41.6	
Relative Condylar Inclination 6	----°	43.0	
Relative Condylar Inclination 7	----°	34.5	
Relative Condylar Inclination 8	----°	27.7	
Anterior Guidance (S-AOP)	°		
Relative Anterior Guidance	°		
Esthetic Measurement (Lip Relation)	Norm	Value	Trend
Esthetic Plane	-2.3 mm	1.0	1+*



Pic. 12. Cephalometric analyses

Interactive Verbal Analysis

The skeletal trend of the skull is mesiofacial.

The skeletal trend of the mandible is strongly brachyfacial.

Skeletal class is severe II.

The maxilla is positioned extremely prognathic.

The mandible is positioned neutral, with tendency to prognathic.

The lower facial height is normal.

Dental class unknown.

The protrusion of the upper incisor is normal.

The inclination of the upper incisor is extremely increased (-430398262.1078405368˚!).

The protrusion of the lower incisor is normal.

The inclination of the lower incisor is normal.

The interincisal angle is strongly diminished.

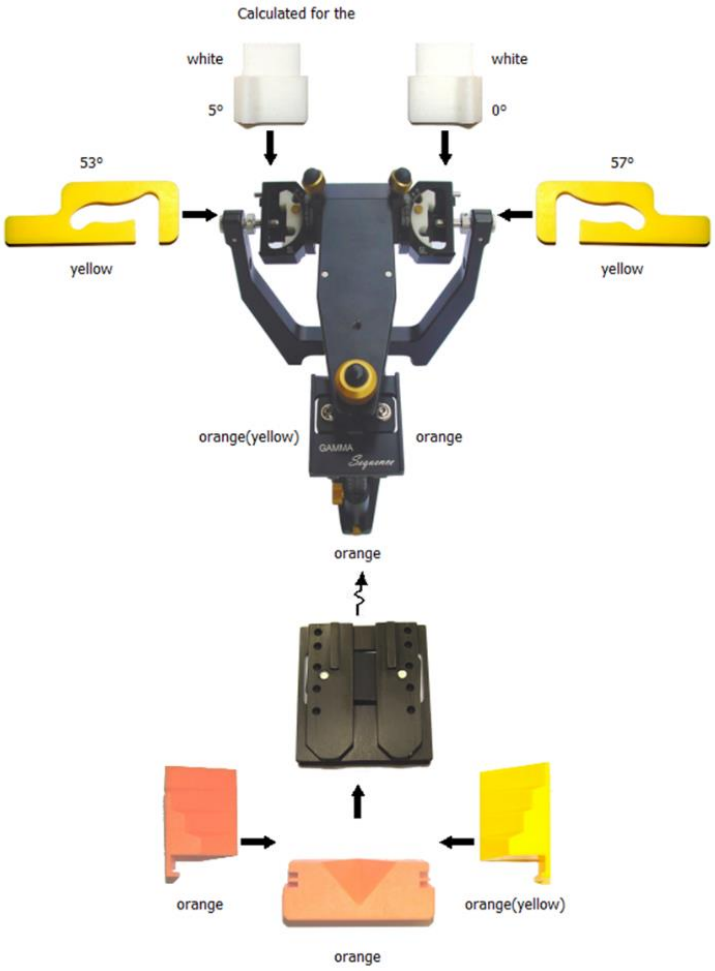
Occlusal concept: group function.

No functional statement available.

Table №6

Determinants	Norm	Value	Trend
Facial Axis	90.0˚	93.0	1B*
Facial Depth	89.0˚	82.9	2-**
Facial Taper	68.0˚	68.1	
Mandibular Plane	24.0˚	28.8	1D*
Related Values	Norm	Value	Trend
Bjoerk Sum	396.0˚	365.6	4-***>
Facial Lenghth Ratio	63.5%	69.8	3+***
Y Axis to S N	67.0˚	63.9	1-*
Y Axis (Downs)	61.2˚	64.9	1+*
S N to Gonion Gnathion Angle	32.6˚	25.6	2-**

Articulator settings

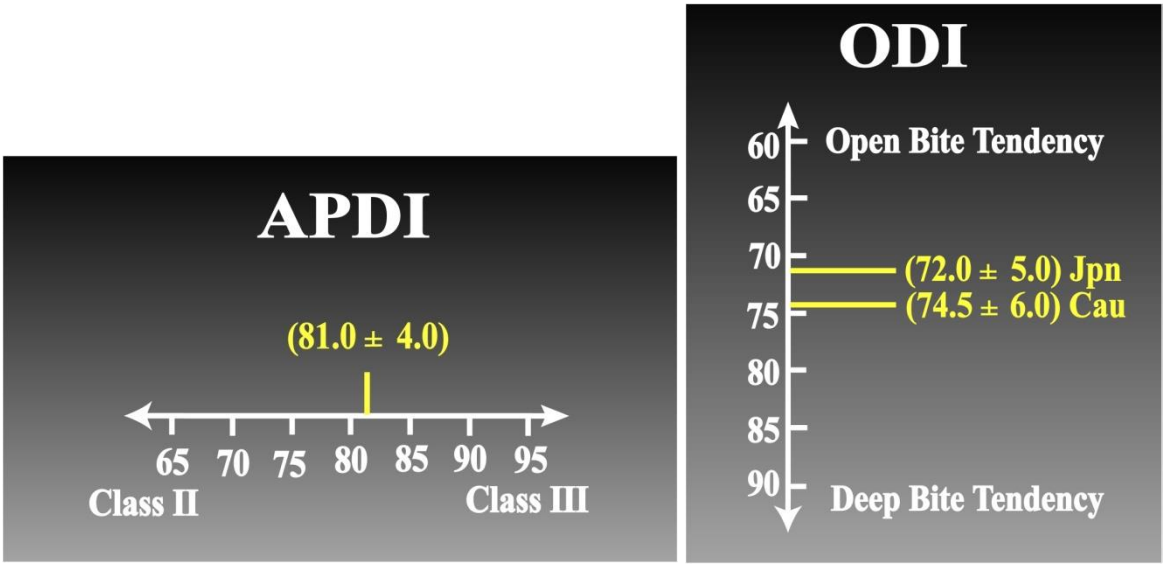


Pic. 13. Articulator settings

Sato analyses

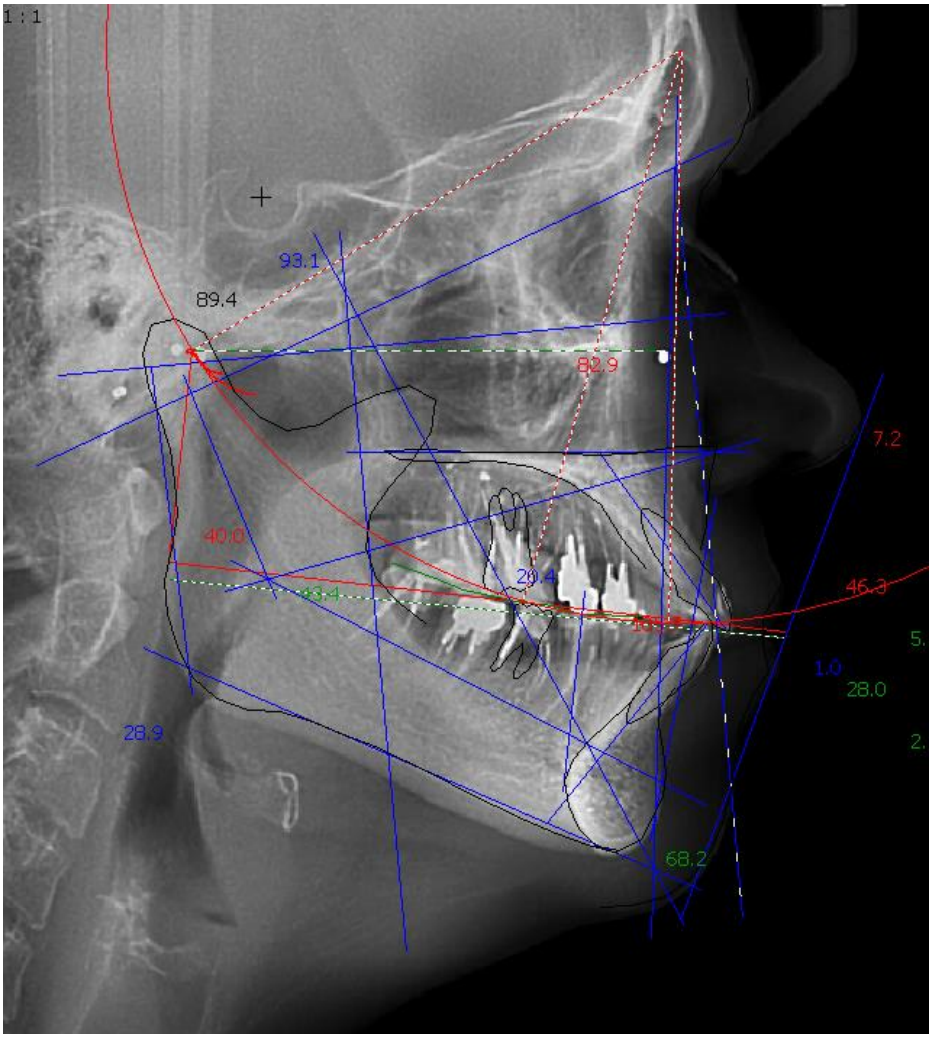
Sato Analysis

Denture frame analysis	Norm	Value	Trend
FH - MP	25.9 °	26.6	
PP - MP	24.6 °	21.5	
OP - MP	13.2 °	12.2	
OP - MP / PP - MP	54.0 %	56.7	
AB - MP	71.3 °	82.8	2+**
A'-P'	50.0 mm	50.8	
A'-6'	23.0 mm	24.7	
A'-6' / A'-P'	50.0 %	48.6	
U1 - AB (degree)	31.7 °	49.6	4+***>
U1 - AB (mm)	9.5 mm	6.3	2-**
L1 - AB (degree)	25.4 °	24.6	
L1 - AB (mm)	6.2 mm	3.3	2-**
Inter molar angle	174.0 °	166.4	2+**
FH - PP	1.3 °	5.1	3+***
Kim analysis	Norm	Value	Trend
ODI	72.0 °	87.9	3+***
APDI	81.0 °	75.6	1+*
Combination factor	153.0 °	163.5	1+*
Downs-Graber analysis	Norm	Value	Trend
Facial angle	84.9 °	82.9	
Convexity	-7.6 °	-16.4	1-*
AB - Facial plane angle	-4.8 °	-12.4	2-**
FH - MP	25.9 °	26.6	
Y Axis	65.4 °	64.5	
FH - OP	11.4 °	14.4	
Interincisal angle	124.1 °	105.7	2+**
L1 - OP	66.2 °	57.4	1+*
L1 - MP	96.3 °	107.4	1D*
U1 - A.POG	8.9 mm	5.4	1-*
FH - SN	6.2 °	178.9	59D***>
SNA Angle	83.3 °	91.3	2D**
SNB Angle	78.9 °	83.9	1D*
ANB Angle	3.4 °	7.3	2D**
U1 - Facial Plane (mm)	11.7 mm	10.1	
U1 - FH (deg)	111.1 °	120.1	1+*
U1 - SN (deg)	104.5 °	121.1	2+**
Gonial angle	122.2 °	114.6	1-*
Ramus Inclination	2.9 °	-1.9	1+*



ODI = 87 – deep bite tendency

APDI = 75 class II



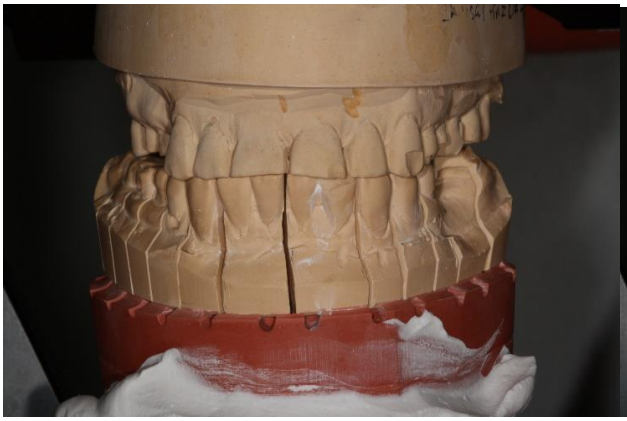
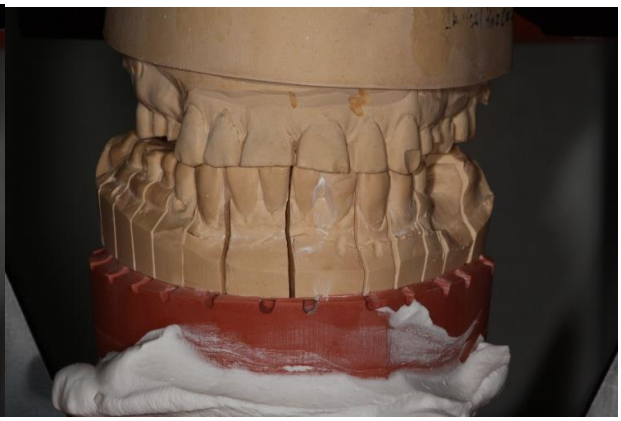
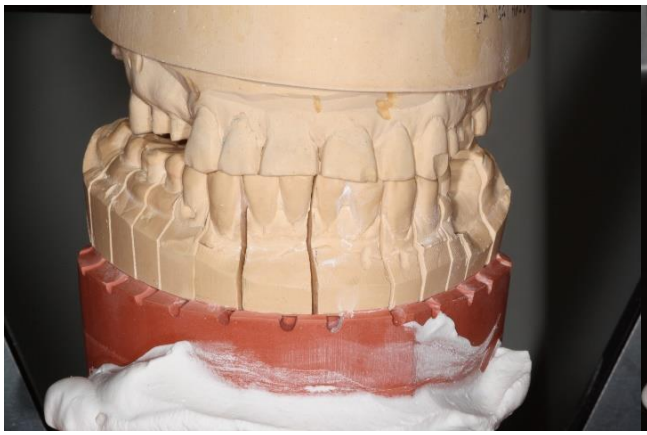
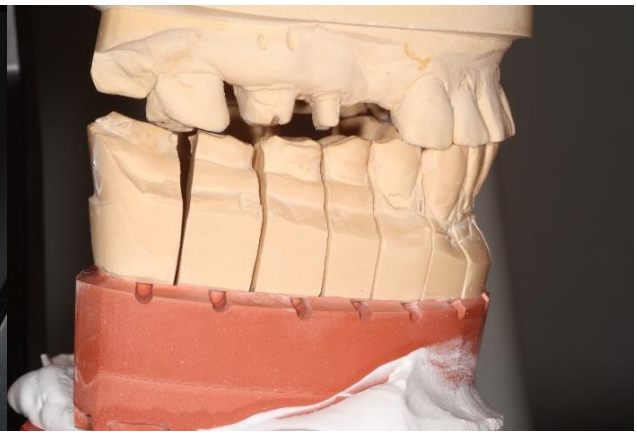
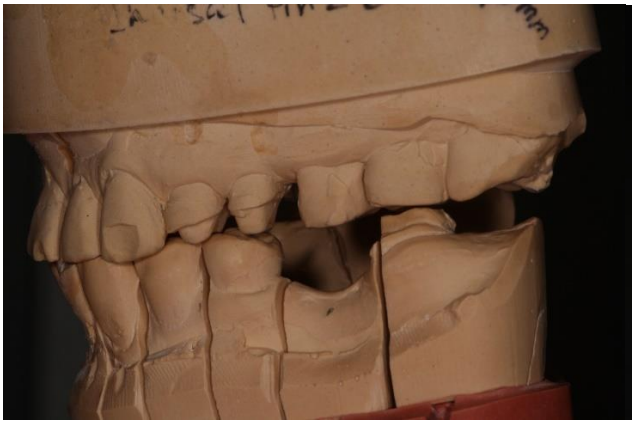
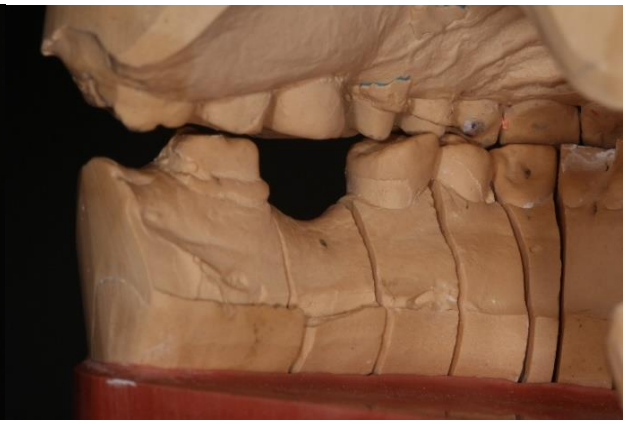
- symmetrical case SCI r = 49 degrees left=47 degrees
- OPI right should be 7 degrees
- OPI left = 6 degrees DOA=10
- LFH increase +4 mm on incisal pin (both upper and lower jaw are in protruded position)
- Bennett movement

Incisal Pin Table

Incisal Pin Height	0.0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
Lower Facial Height	43.4	43.8	44.2	44.6	45.0	45.4	45.8	46.5	47.2	47.9	48.6	49.2	50.5
LFH. (Norm)	45.2	45.3	45.4	45.5	45.6	45.7	45.8	46.0	46.2	46.4	46.6	46.8	47.2
LFH. (Variation)	0.0	0.4	0.8	1.2	1.6	2.0	2.4	3.1	3.8	4.5	5.2	5.8	7.1
Menton Vertical	0.0	0.5	0.9	1.3	1.8	2.2	2.6	3.4	4.2	4.9	5.6	6.3	7.5
Pogonion Sagittal	0.0	-0.8	-1.5	-2.3	-3.0	-3.8	-4.6	-6.1	-7.7	-9.3	-10.9	-12.5	-15.7
Incision Inf. Vertical	0.0	0.6	1.2	1.7	2.3	2.8	3.4	4.4	5.5	6.4	7.4	8.3	10.1
Incision Inf. Sagittal	0.0	-0.5	-1.1	-1.6	-2.2	-2.7	-3.3	-4.5	-5.6	-6.8	-8.1	-9.3	-11.8

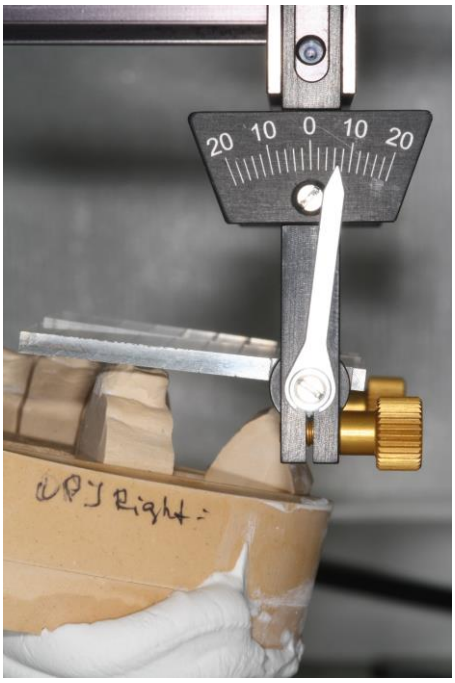
Incisal Pin Height	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-6.0	-8.0	-10.0	-12.0	-14.0	-16.0	-20.0
Lower Facial Height	43.4	43.0	42.5	42.1	41.7	41.2	40.7	39.8	38.8	37.7	36.6	35.4	32.9
LFH. (Norm)	45.2	45.1	44.9	44.8	44.7	44.6	44.5	44.3	44.1	43.8	43.6	43.4	42.9
LFH. (Variation)	0.0	-0.4	-0.9	-1.3	-1.7	-2.2	-2.7	-3.6	-4.6	-5.7	-6.8	-8.0	-10.5
Menton Vertical	0.0	-0.5	-0.9	-1.4	-1.9	-2.4	-3.0	-4.1	-5.2	-6.4	-7.6	-8.9	-11.7
Pogonion Sagittal	0.0	0.7	1.5	2.2	3.0	3.7	4.4	5.8	7.2	8.6	9.9	11.1	13.5
Incision Inf. Vertical	0.0	-0.6	-1.2	-1.8	-2.4	-3.1	-3.7	-5.1	-6.4	-7.9	-9.3	-10.9	-14.1
Incision Inf. Sagittal	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.9	4.8	5.6	6.4	7.1	8.3

RP

Pic. 14-25. RP

OPI right = 8 degrees

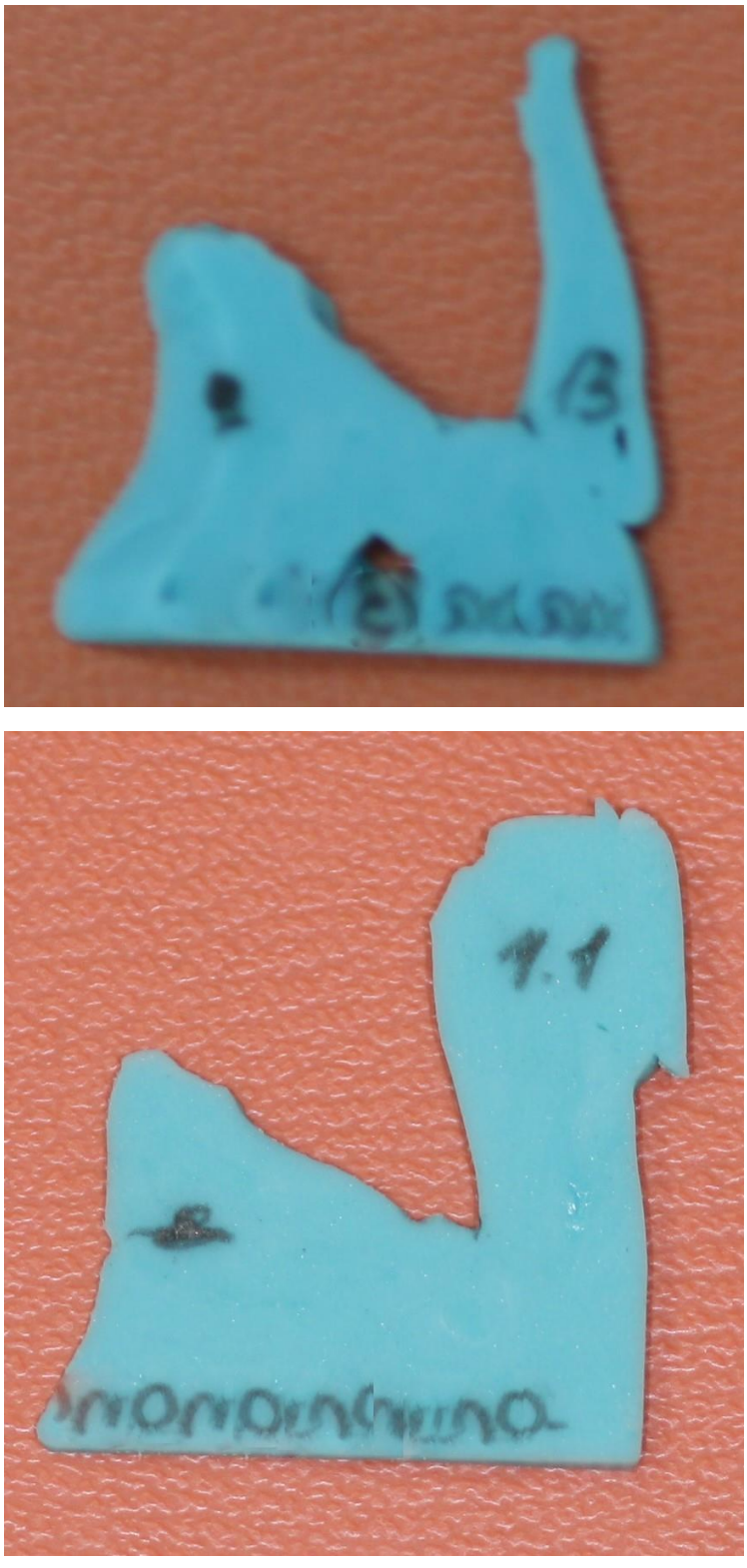


Pic. 26. OPI right

OPI left = 8 degrees, No tooth 36

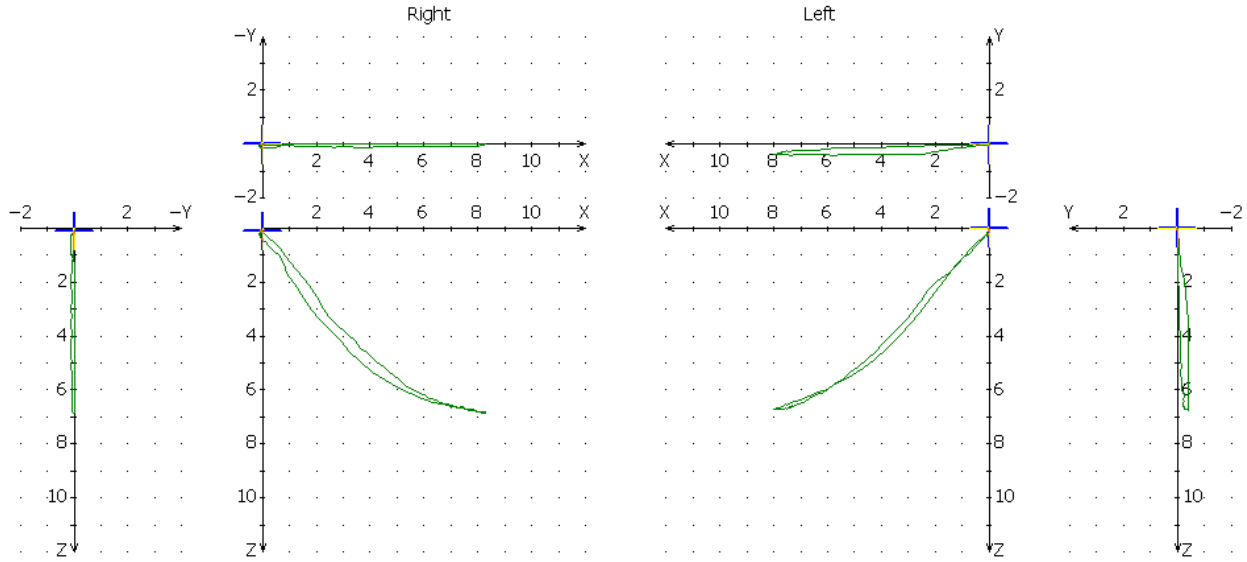
Pic. 27. OPI right

Anterior Guidance



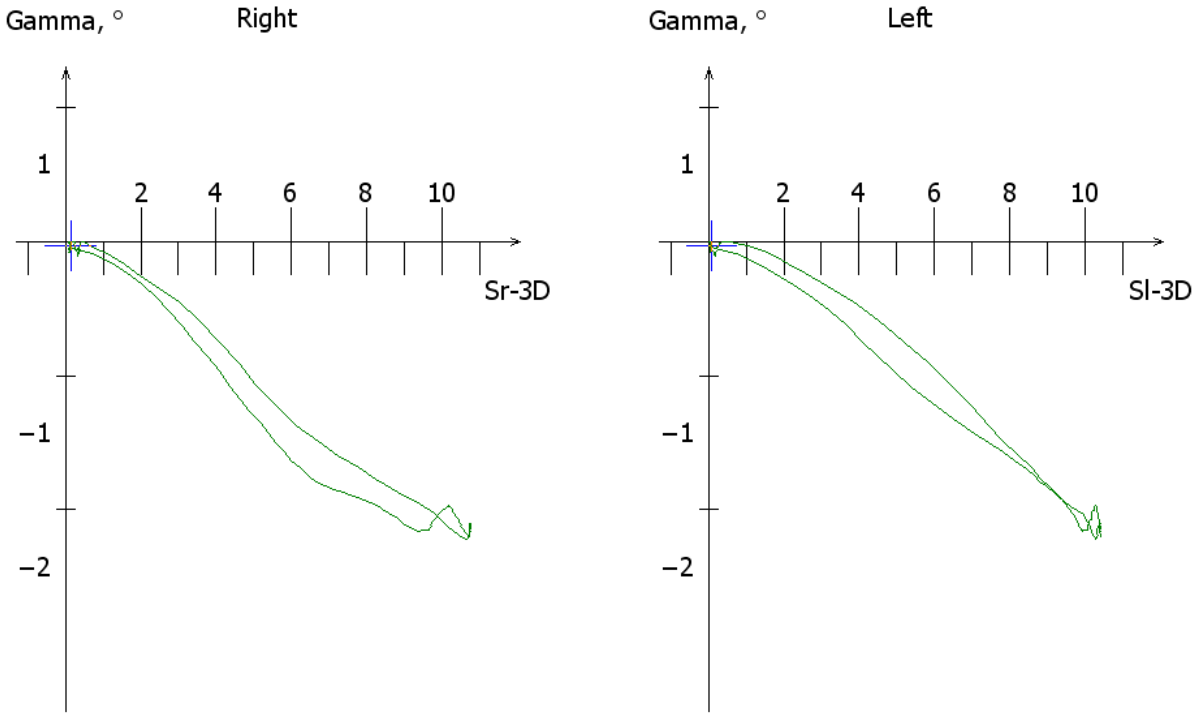
Pic. 28. Anterior Guidance

Protrusion



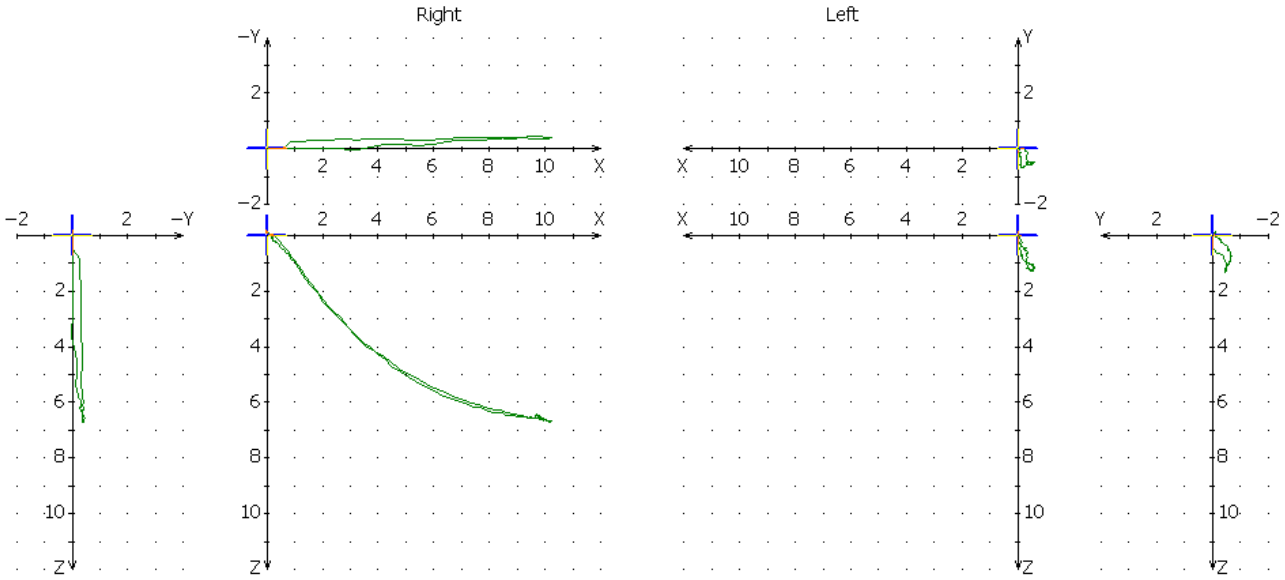
Pic. 29. Protrusion

Translation-rotation in protrusion



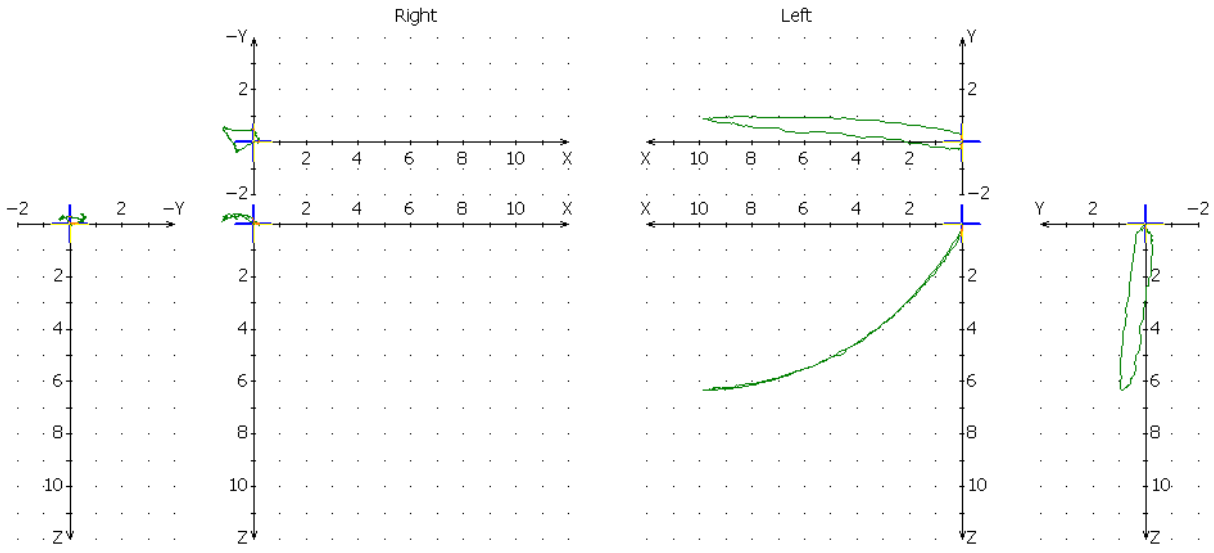
Pic. 30. Translation-rotation in protrusion

Mediotrusion right



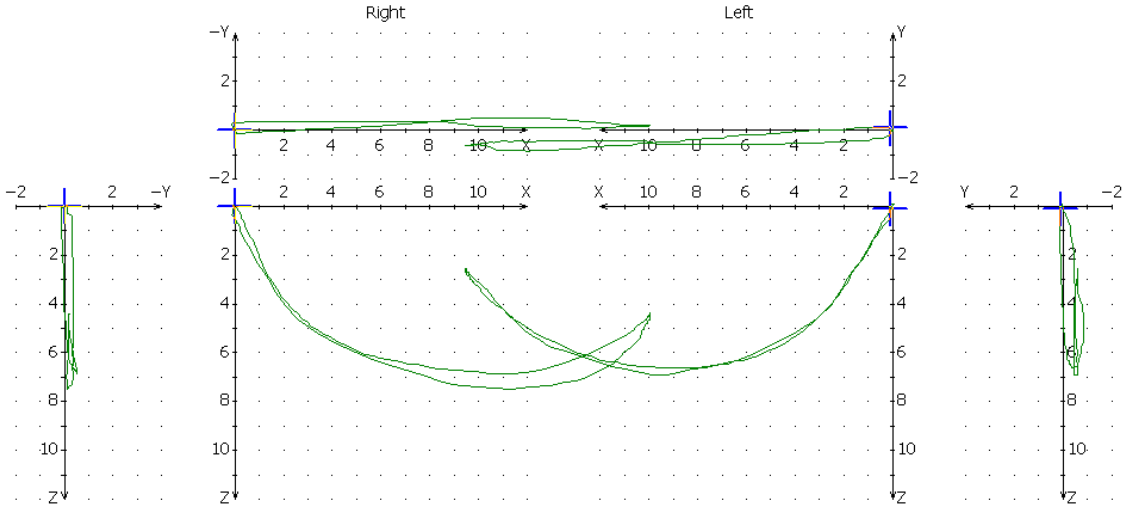
Pic. 31. Mediotrusion right

Mediotrusion left



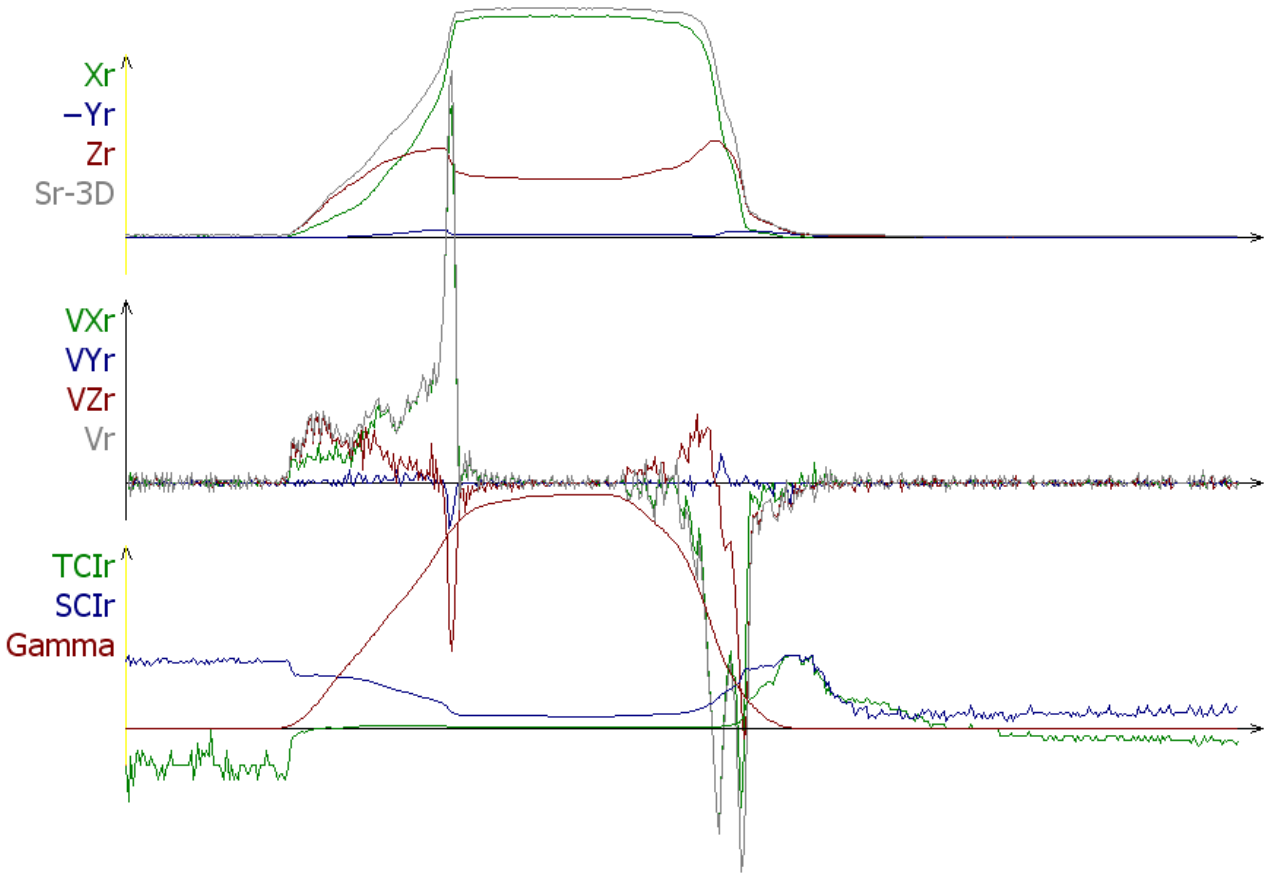
Pic. 32. Mediotrusion left

Open-close



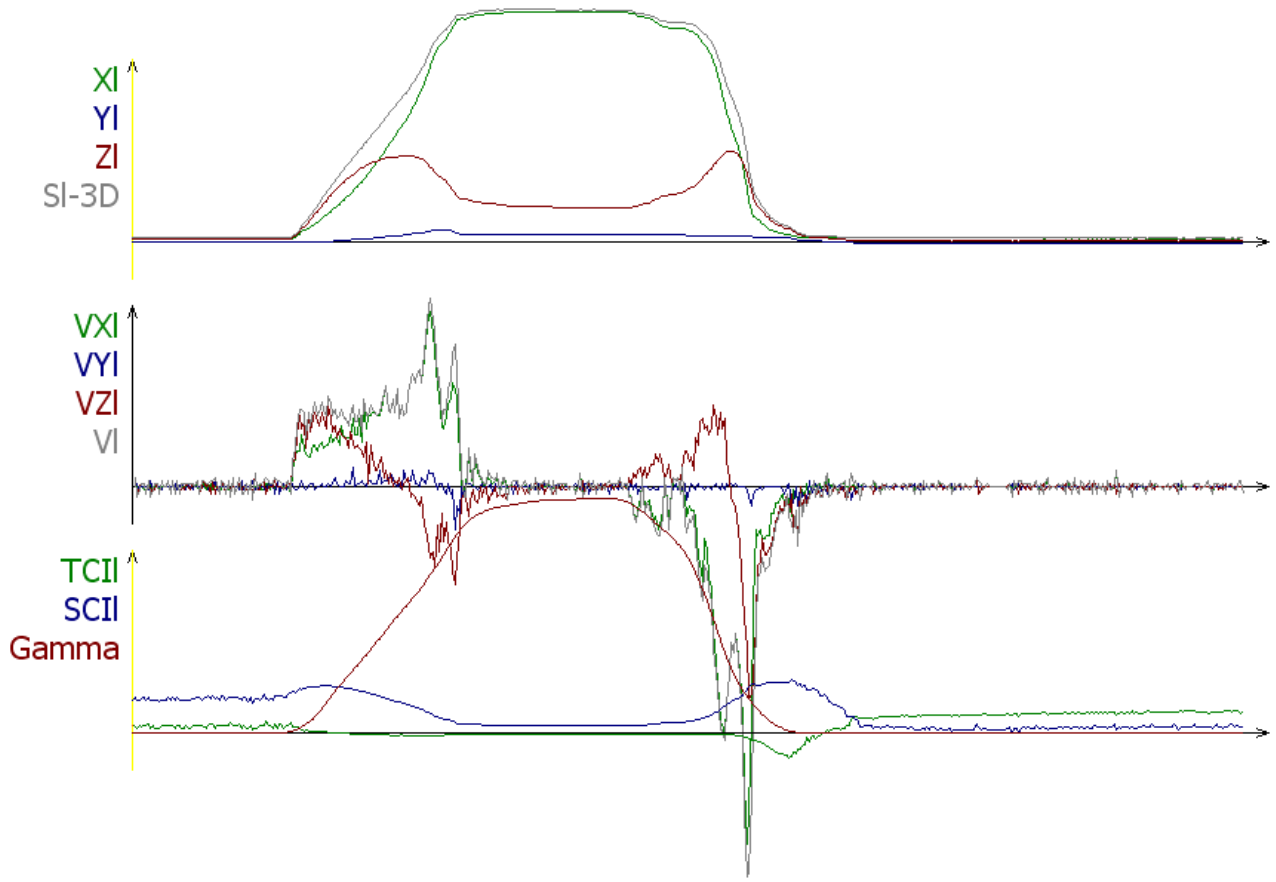
Pic. 33. Open-close

Time curve in open-close movement- clicking right TMJ



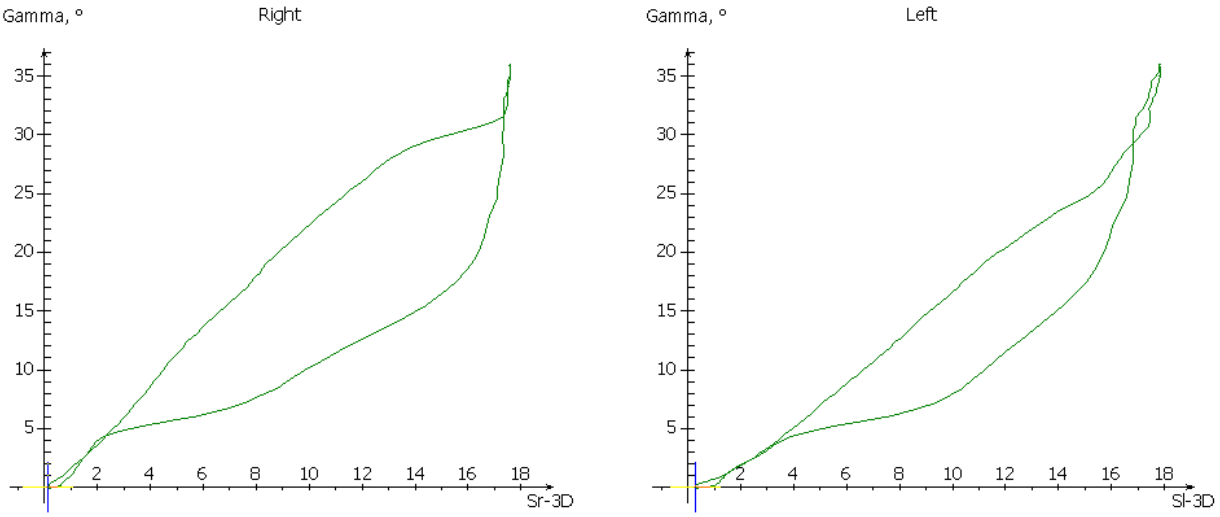
Pic. 34. Time curve in open-close movement- clicking right TMJ

Time curve in open-close movement- clicking left TMJ



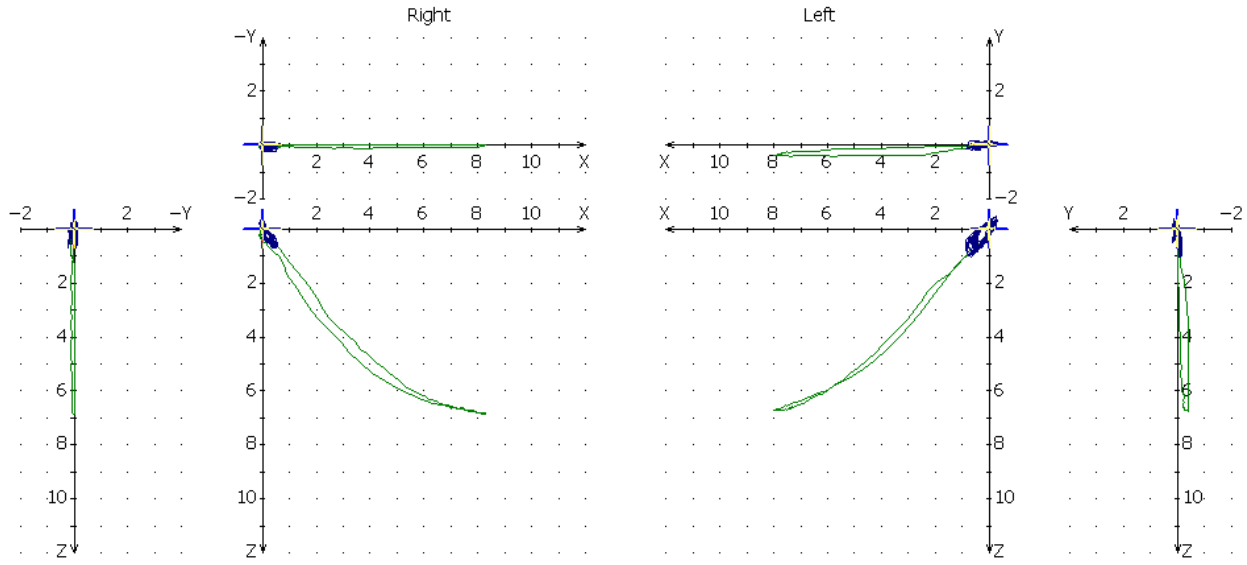
Pic. 35. Time curve in open-close movement- clicking left TMJ

Translation-rotation



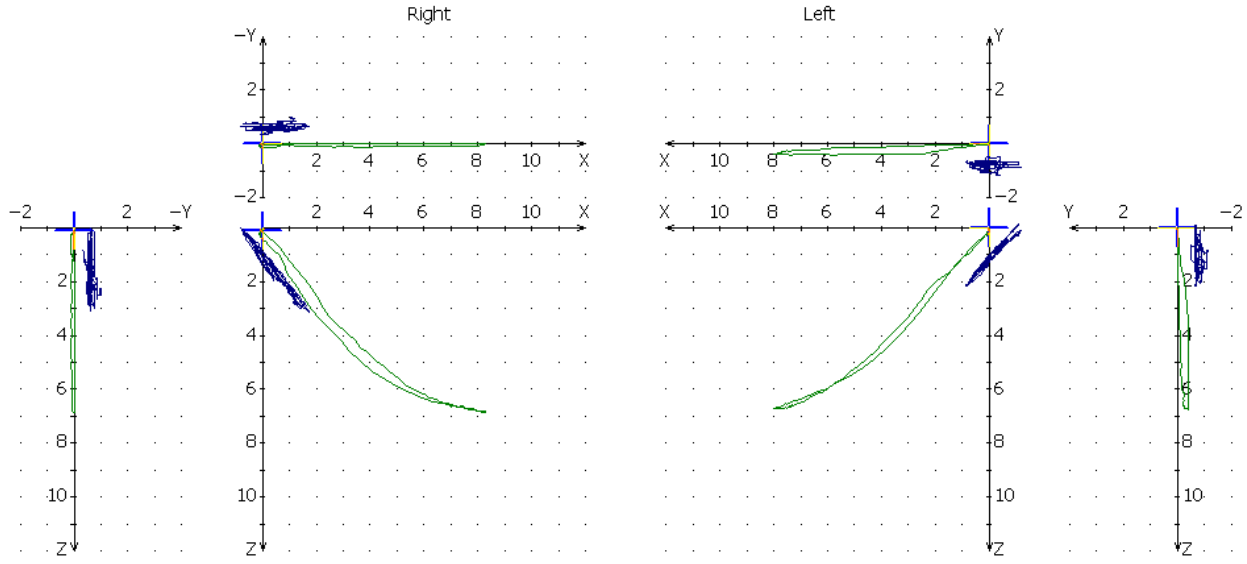
Pic. 36. Translation-rotation

Protrusion - brux



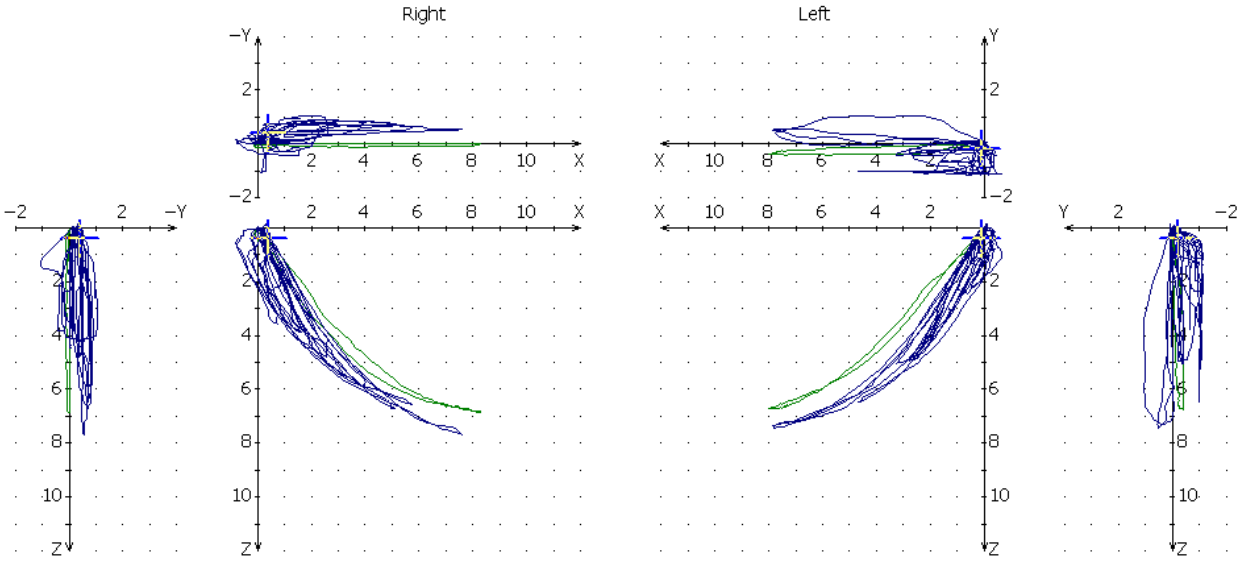
Pic. 37. Protrusion - brux

Protrusion - Speech



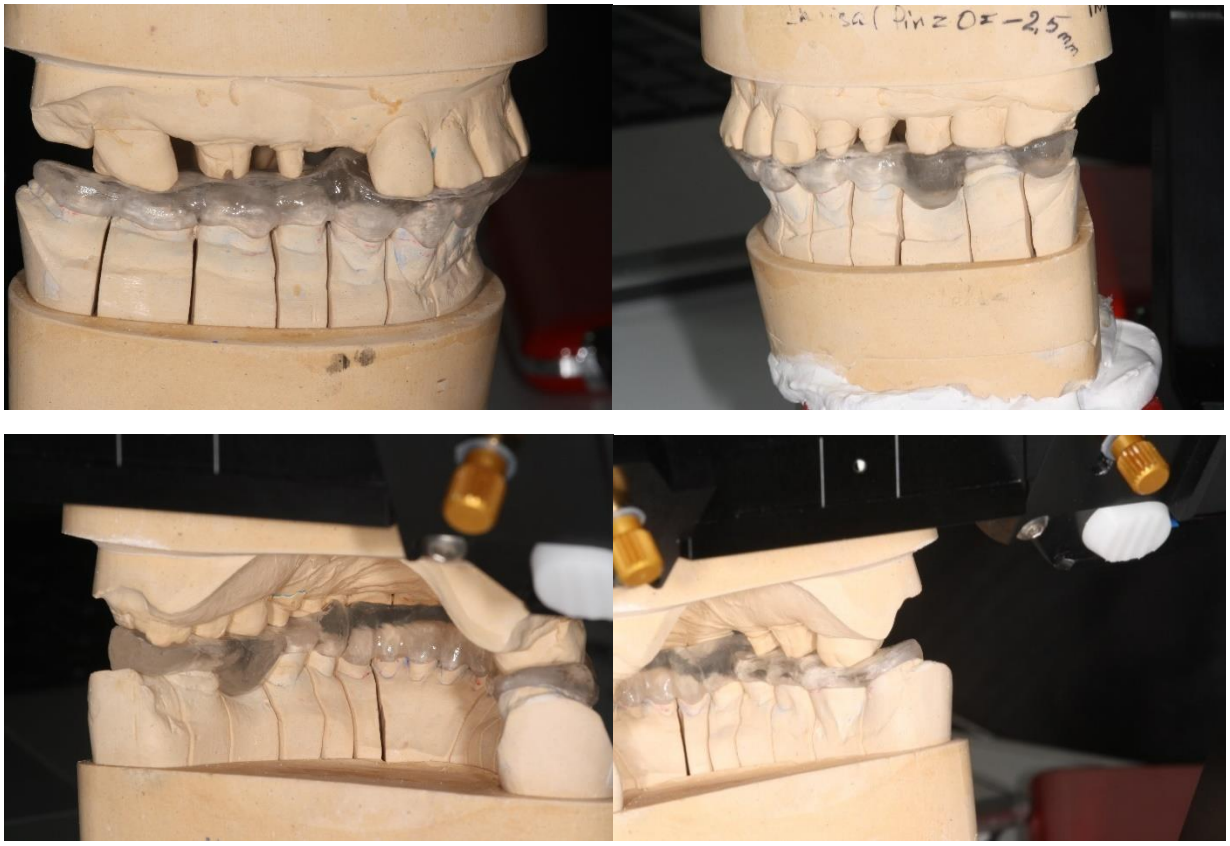
Pic. 38. Protrusion-speech

Protrusion-mastication



Pic. 39. Protrusion-mastication

Myopathic splint

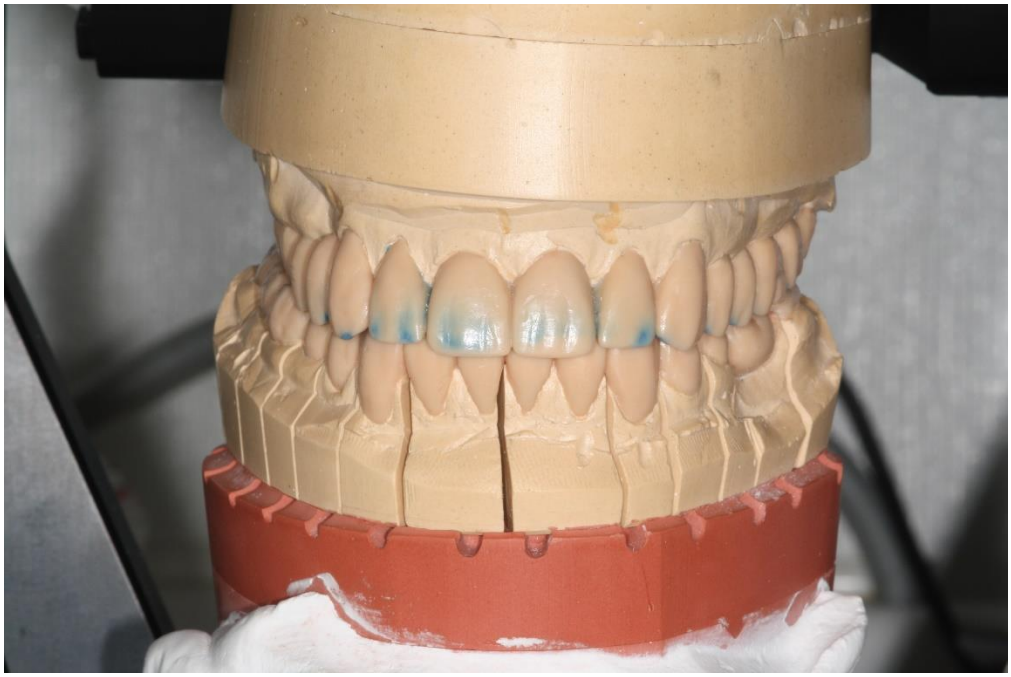


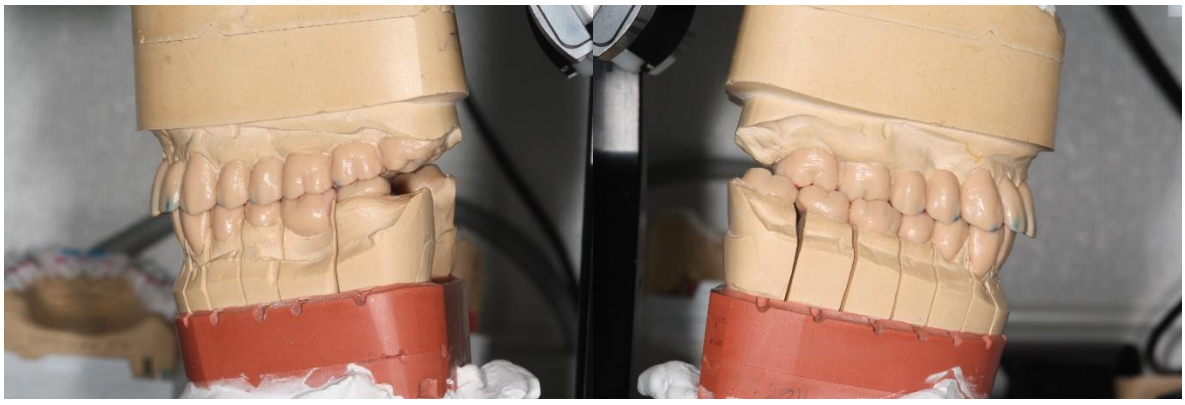
Pic. 40. Myopathic splint

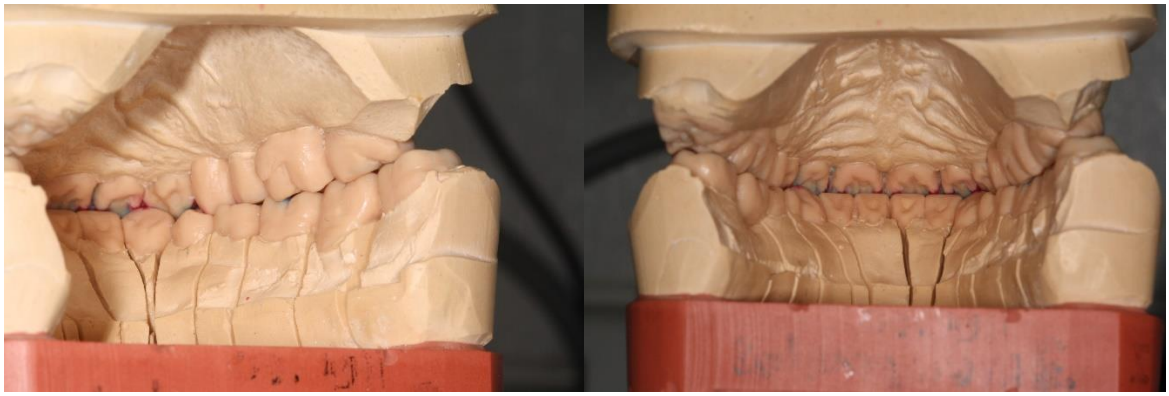
Articulator settings for wax-up

- SCI right and left = 48 black insert
- Bennett – right - white insert = 0 degrees, left- yellow insert = 0 degrees
- OPI both sides = 7 degrees
- LFH- norm
- Incisal table - green-right side, orange - left and frontal part
- Right side 3 class occlusion and left side - ?2 class

Wax-up





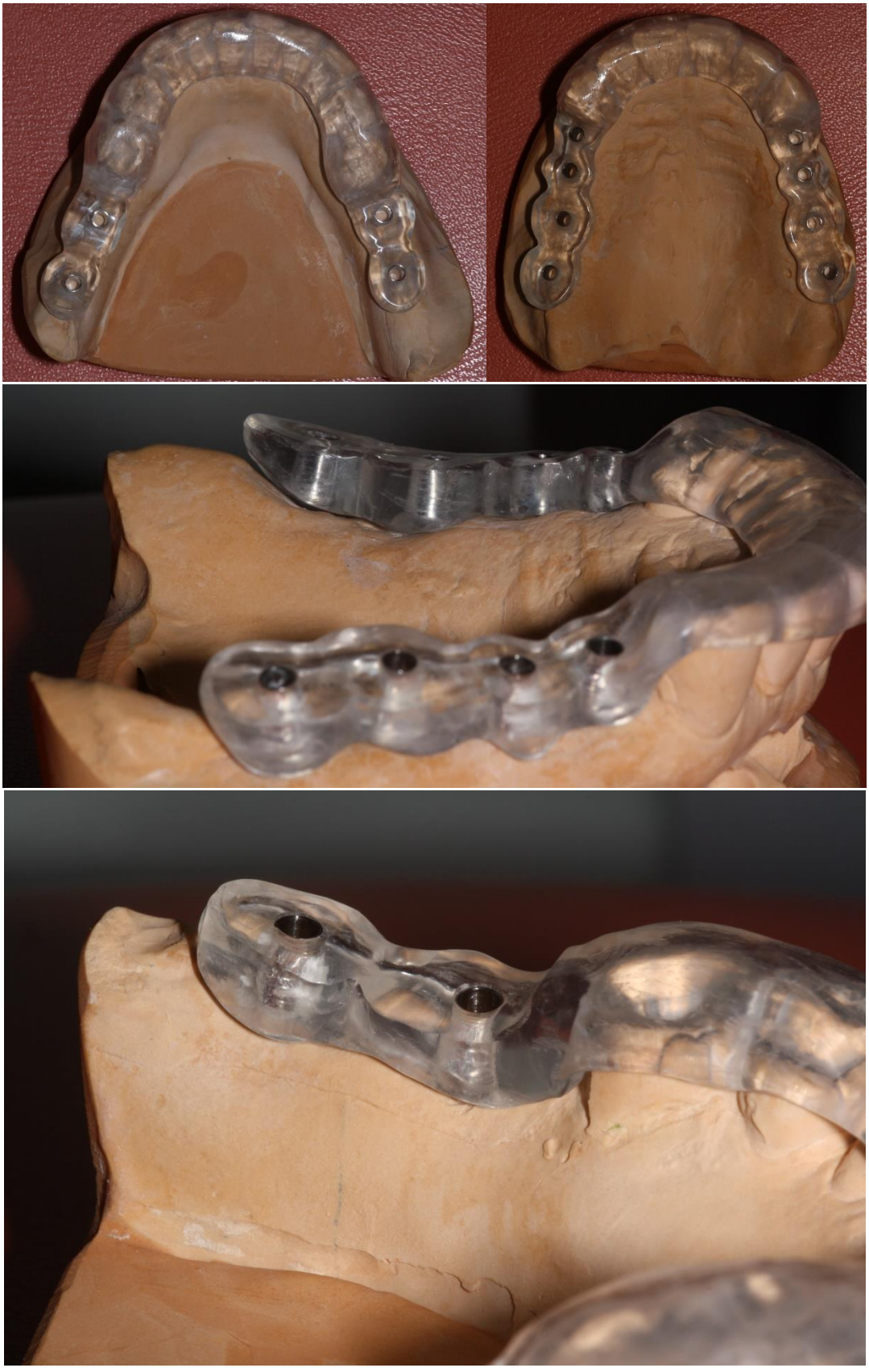


Pic. 41-50. Wax-up

Casts after teeth extraction

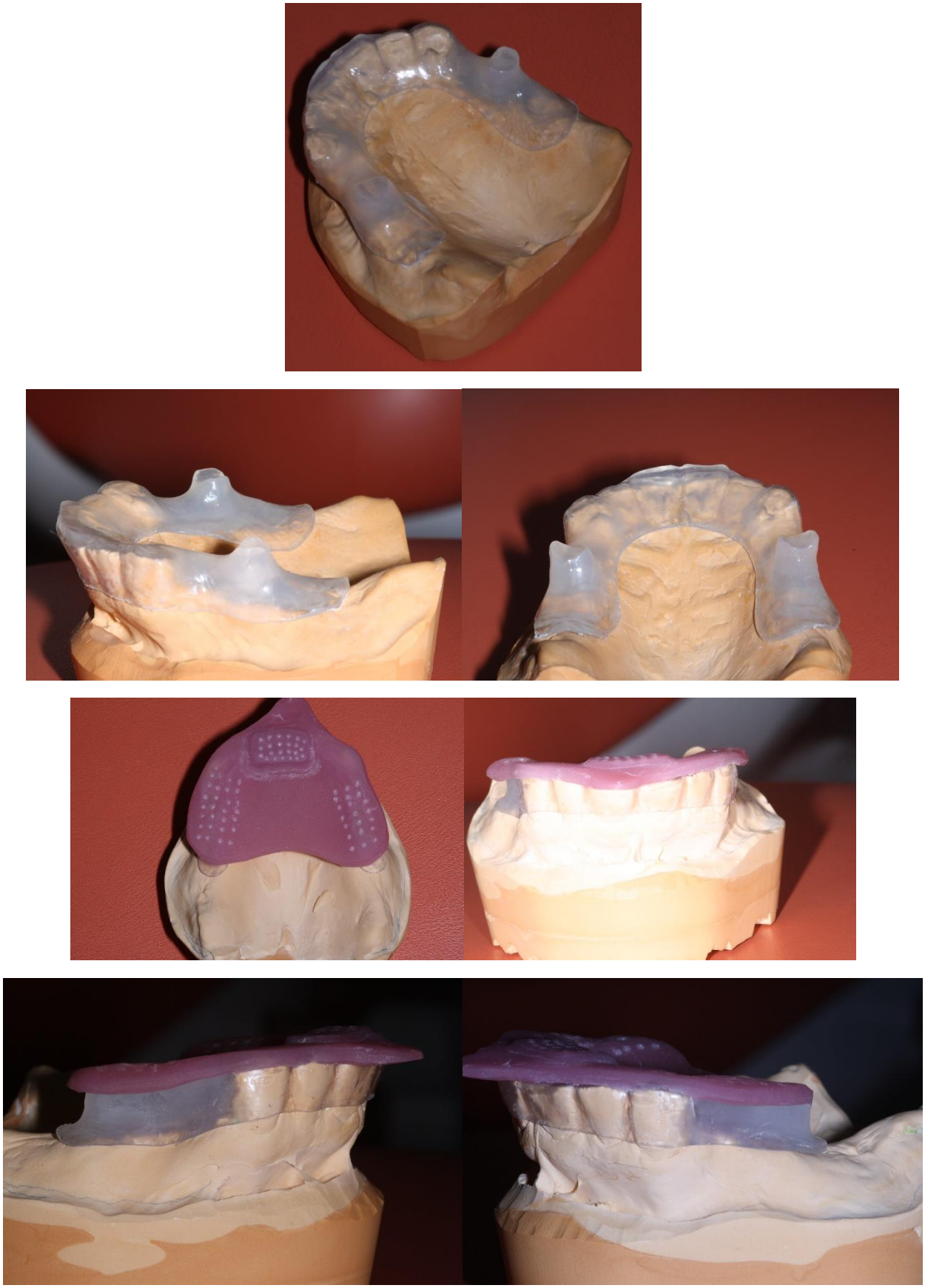
Pic. 51-53. Casts after teeth extraction

Surgical template



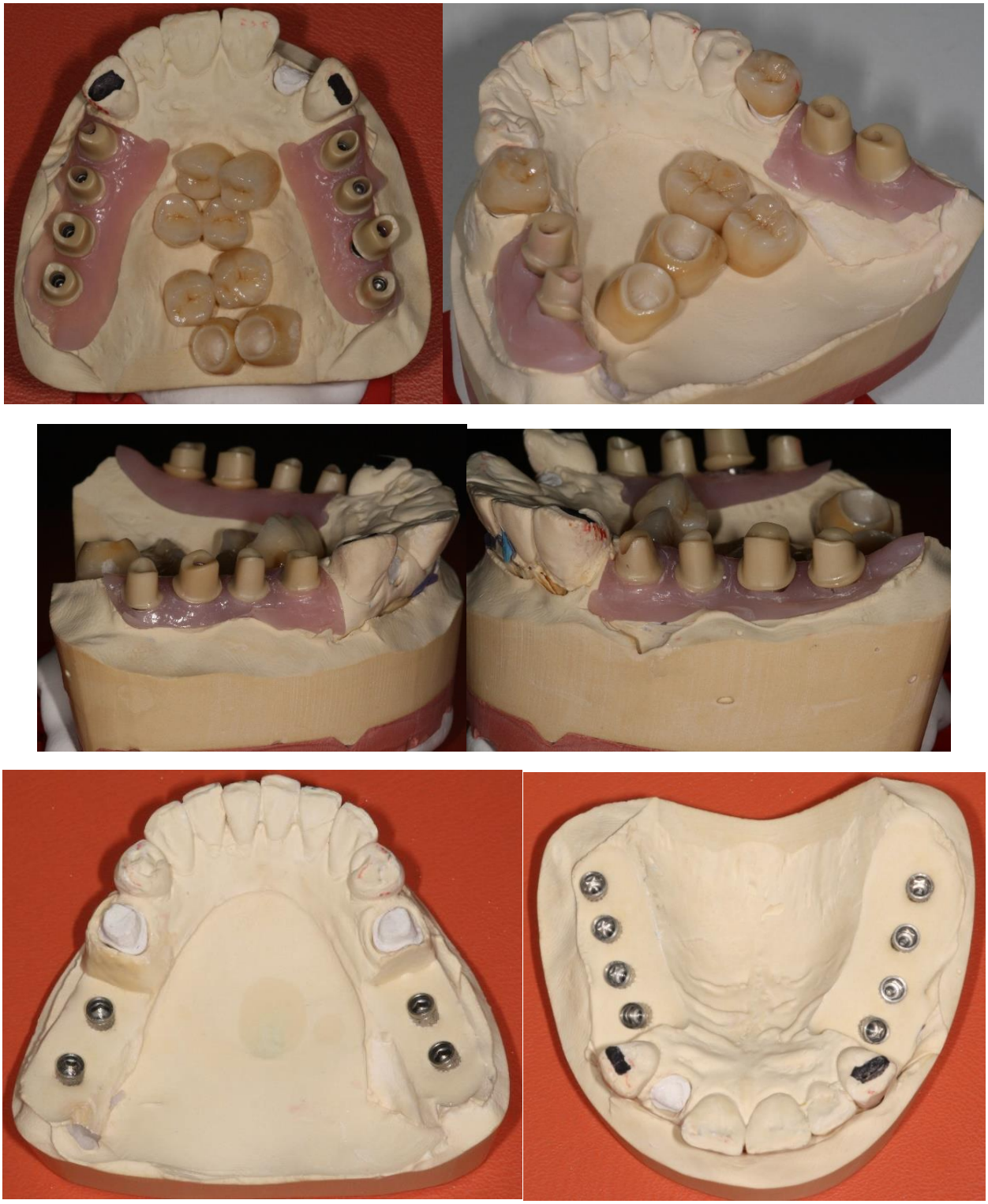
Pic. 54-57. Surgical template

After surgical stage. Determination of Reference position



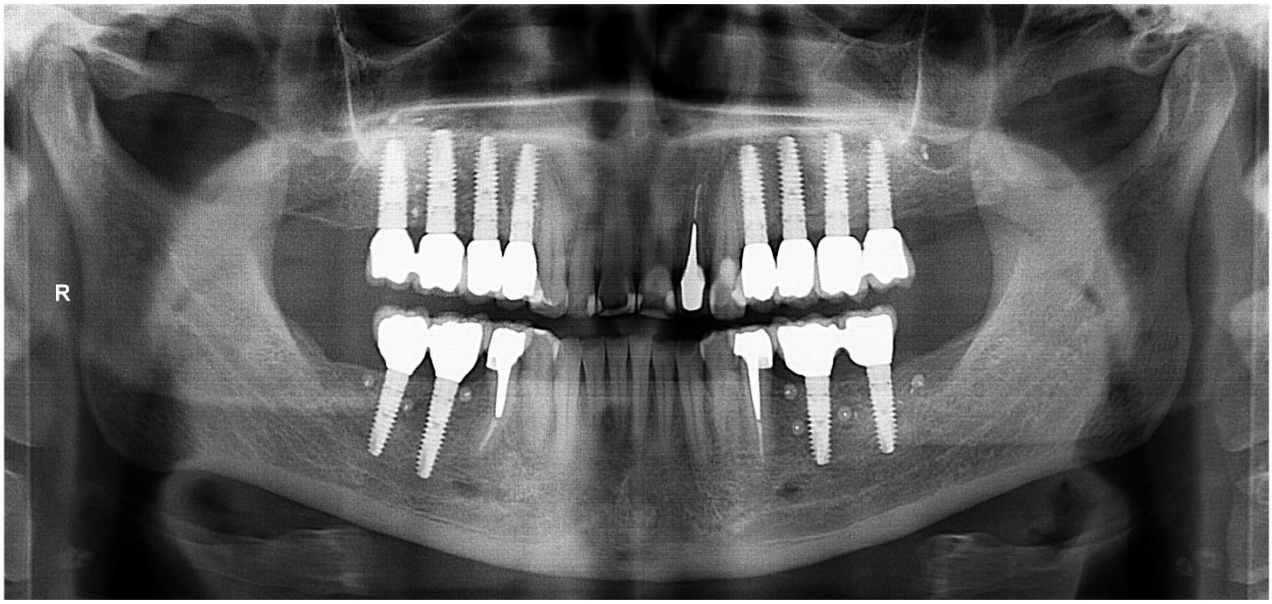
Pic. 58-64. After surgical stage. Determination of Reference position

Final restoration 2013



Pic. 64-69. Final restoration 2013

Orthopantomography December 2013



Pic. 70. Orthopantomography December 2013

Case №2

Date of birth: 1950

Date of examination: 2009

Main concern: esthetic

Intraoral photos 2009

Pic. 1-5. Intraoral photos

List of problems

- Gum recession
- Tooth mobility
- No anterior guidance and canine control
- Chewing problems
- Esthetic problems

Diagnosis

- Sagittal and transversal discrepancy

Treatment objectives

- Posterior support
- Canine control and anterior guidance
- Sagittal and transversal correction of dental arches
- Change OPI and angle of disocclusion

Treatment plan

- Splint therapy
- Hygienist
- Wax-up
- Long time temporaries
- Final restorations

Muscle palpation

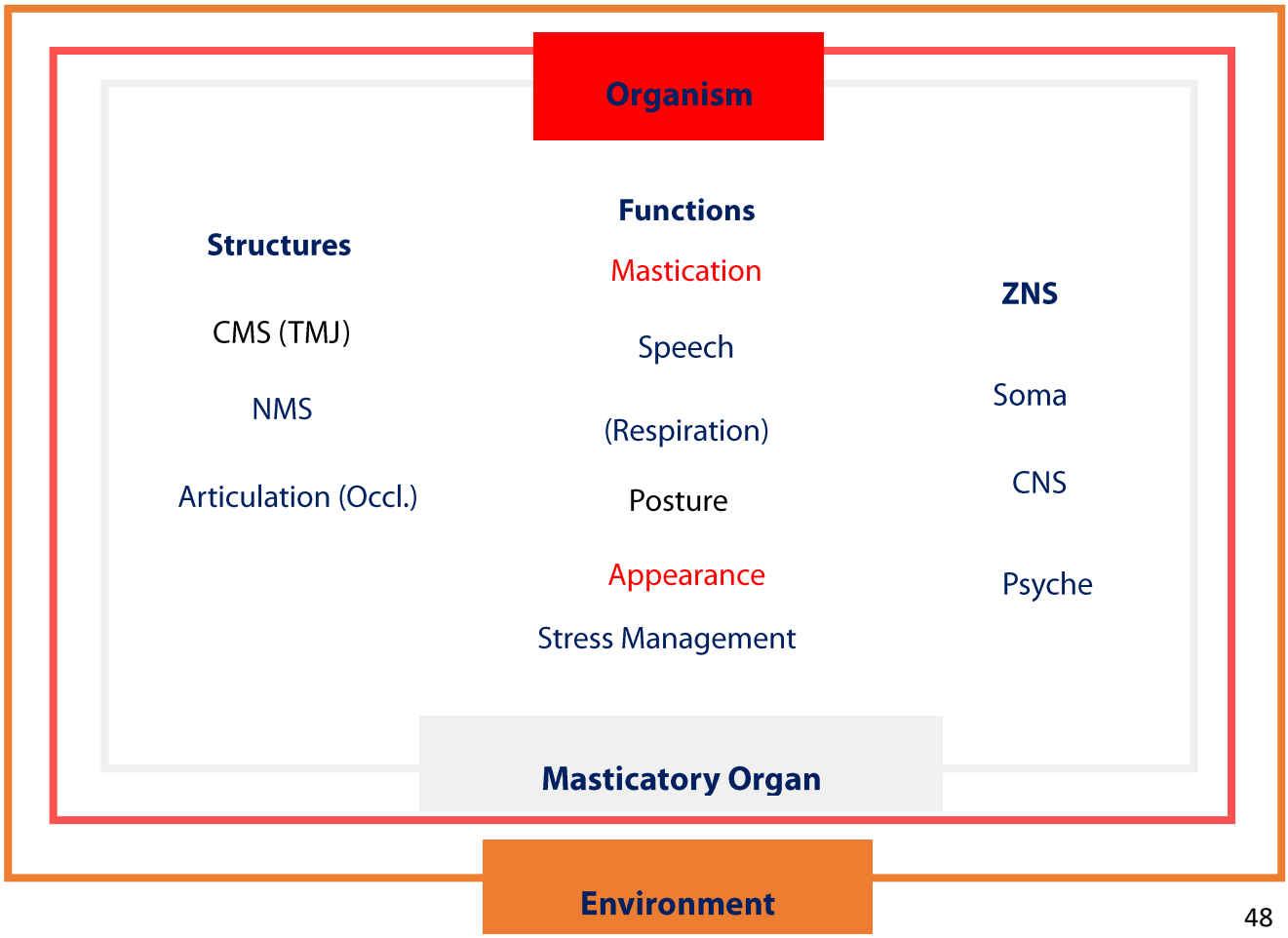
Muscle movements

Table №1

Sets of muscles:	
Muscles palpation	
Posture	1,2,7,12,13,14
Jaw-closing	3a, 3b, 4a, 4b, 5
Jaw-opening / protrusion	8, 9, 10
Retraction	3c, 8
Medio- / Laterotraction	6, 3a, 4a
Sublingual bone position	8, 9,10,11,13
Function	7, 8,9,10,11,14
Joint position Joint Structure, Capsule,Ligaments,Bilaminar zone, M.pterygoideus lateralis, Superior head	15

Cybernetic System of the Masticatory Organ

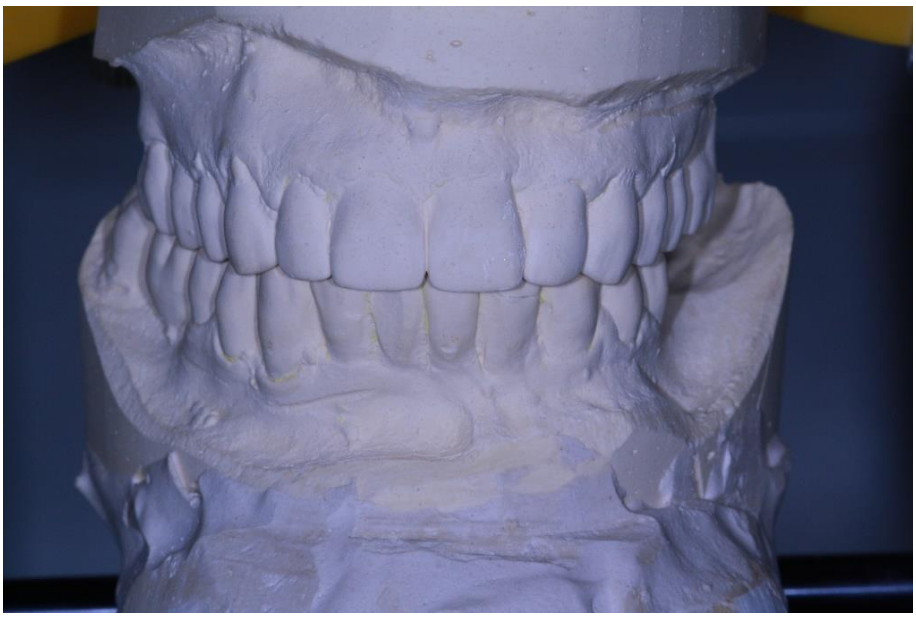
Table №2

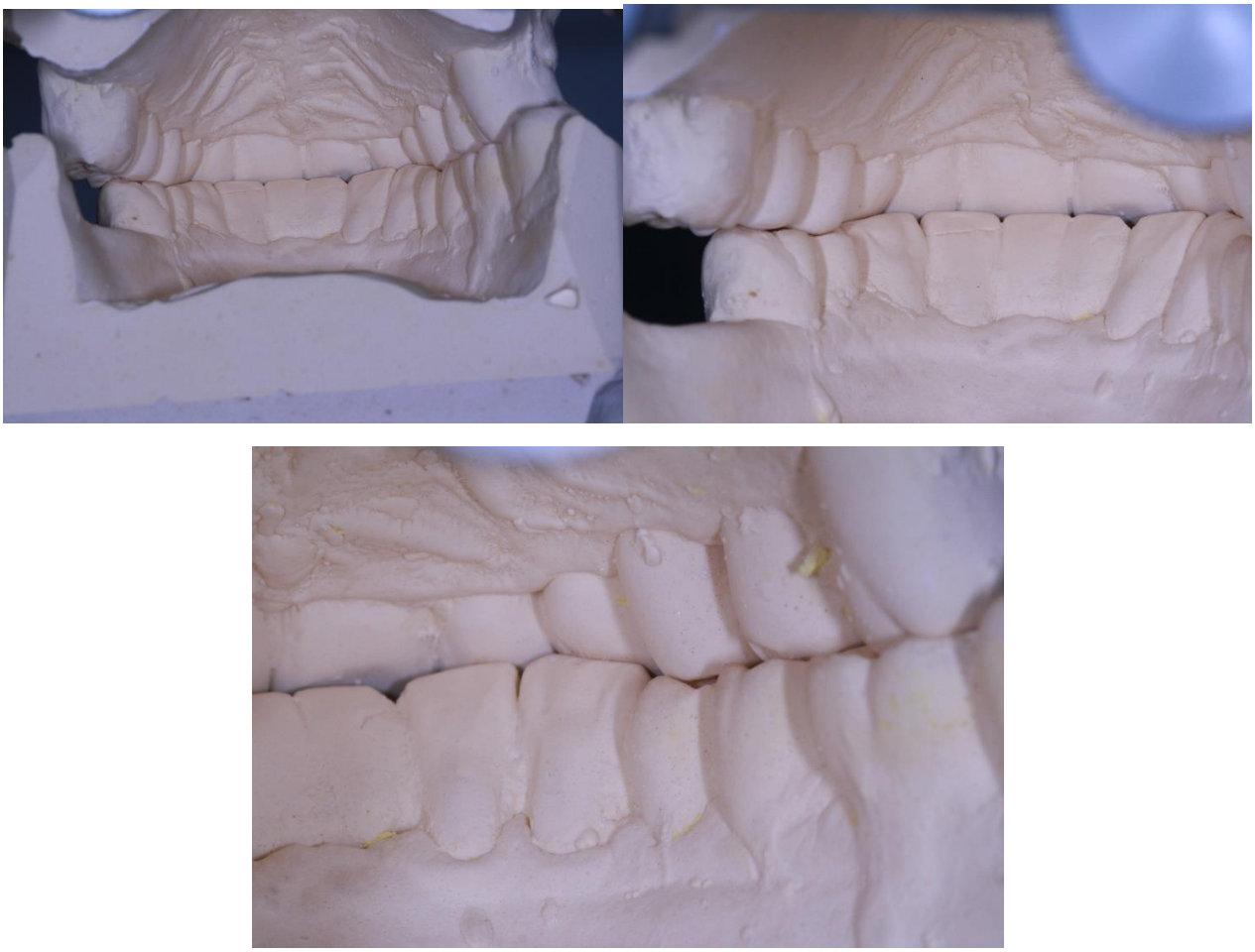


Lateral X ray

Pic. 6. Lateral X ray

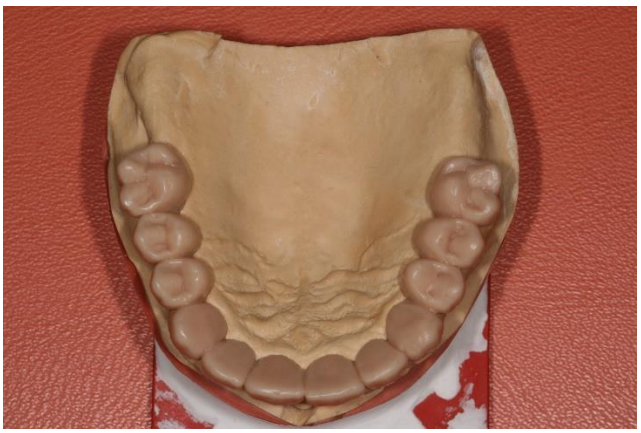
Casts





Pic. 7-14. Casts

Wax-up and operational template

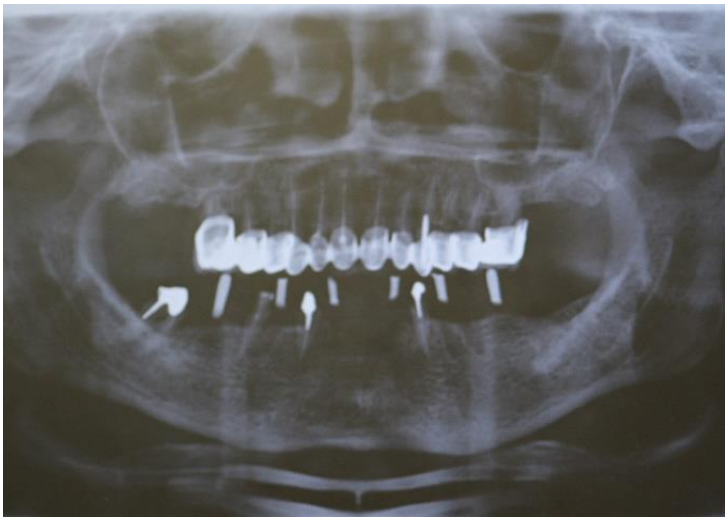


Pic. 15-17. Wax-up and operational template

Lateral X ray after tooth extraction

Pic. 18. Lateral X ray after tooth extraction

OPG with surgical template

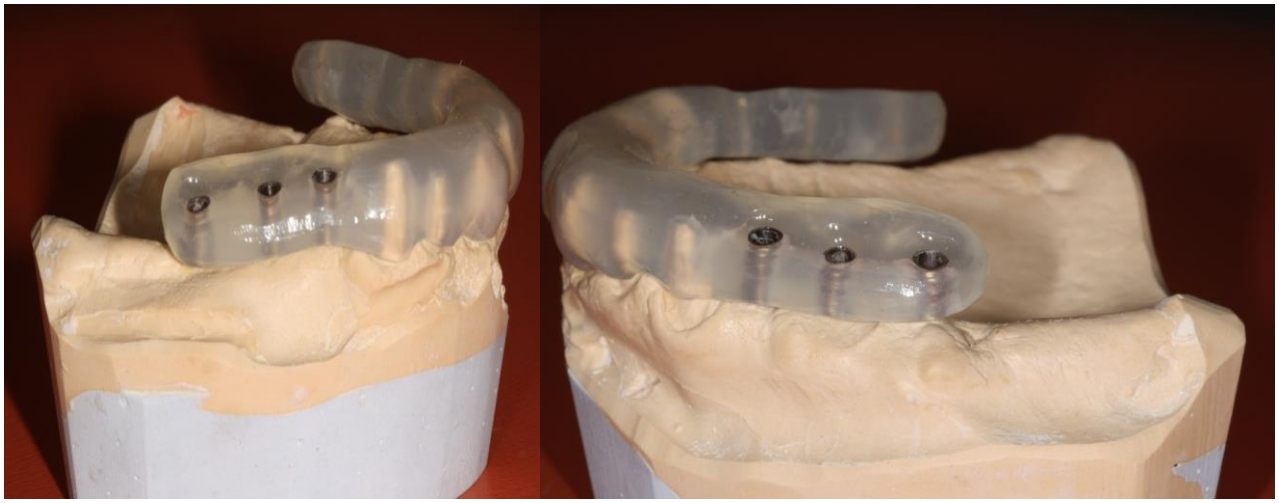


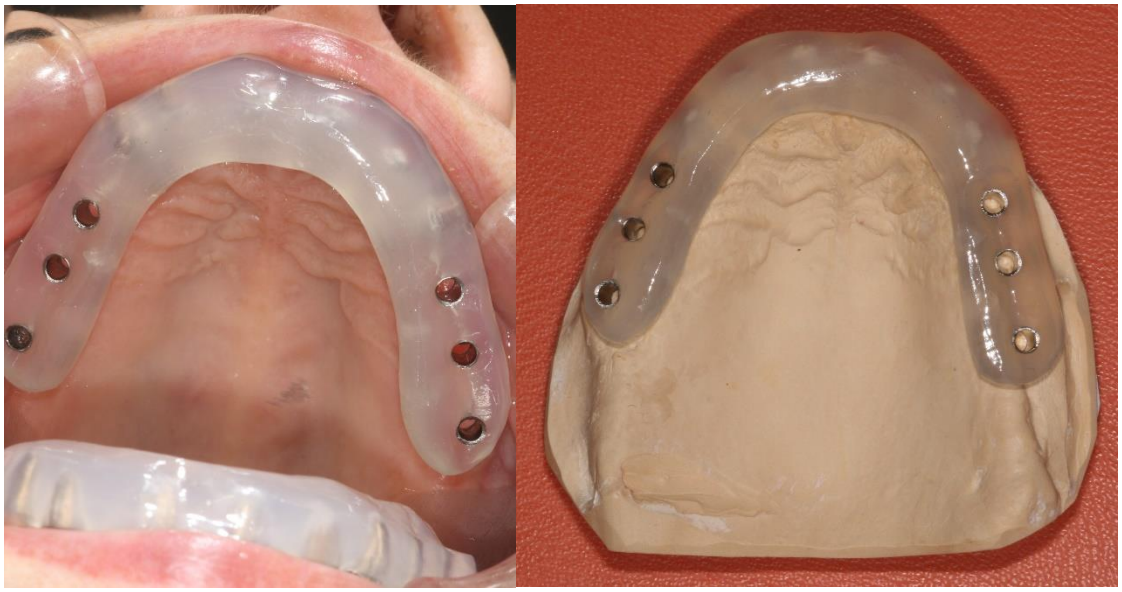
Pic. 19. OPG with surgical template

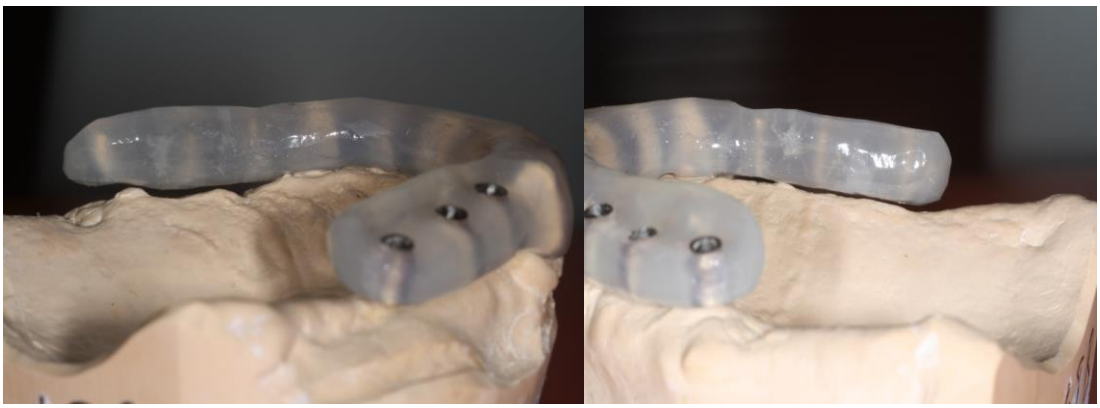
Temporary crowns & Upper casts after teeth extraction

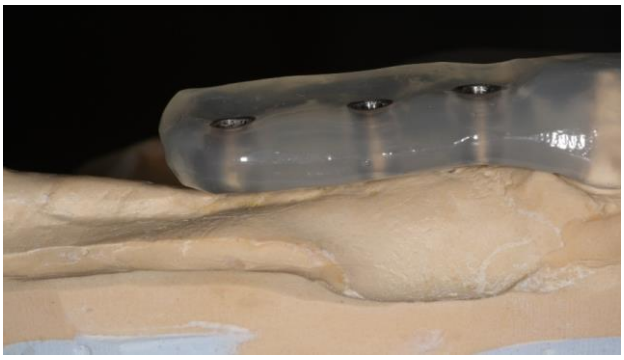
Pic. 20-21. Temporary crowns & Upper casts after teeth extraction

Surgical template for the upper jaw



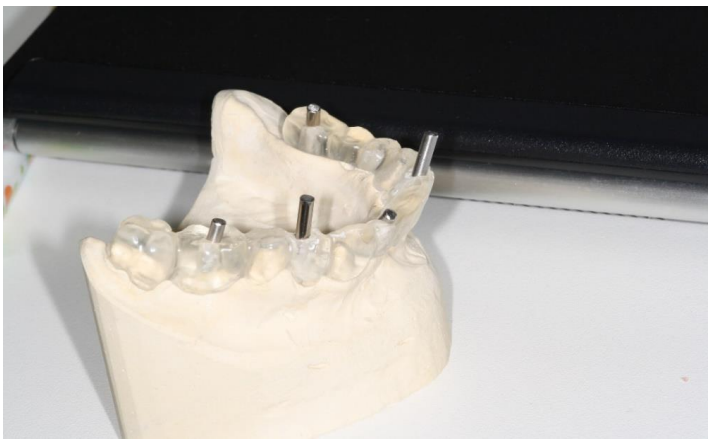


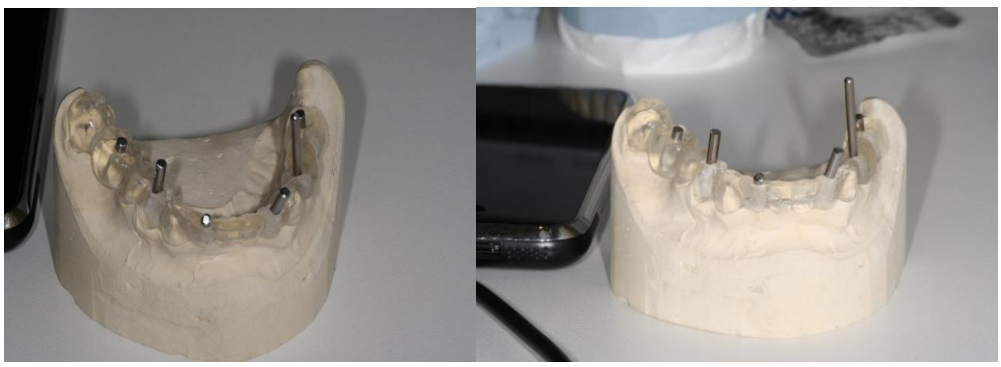




Pic. 22-29. Surgical template for the upper jaw

Surgical template for the lower jaw

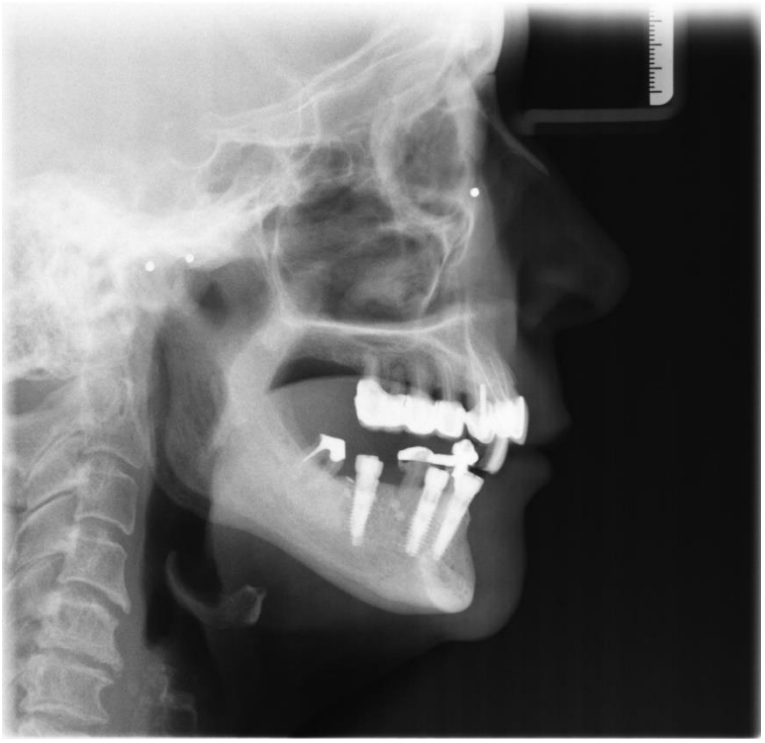


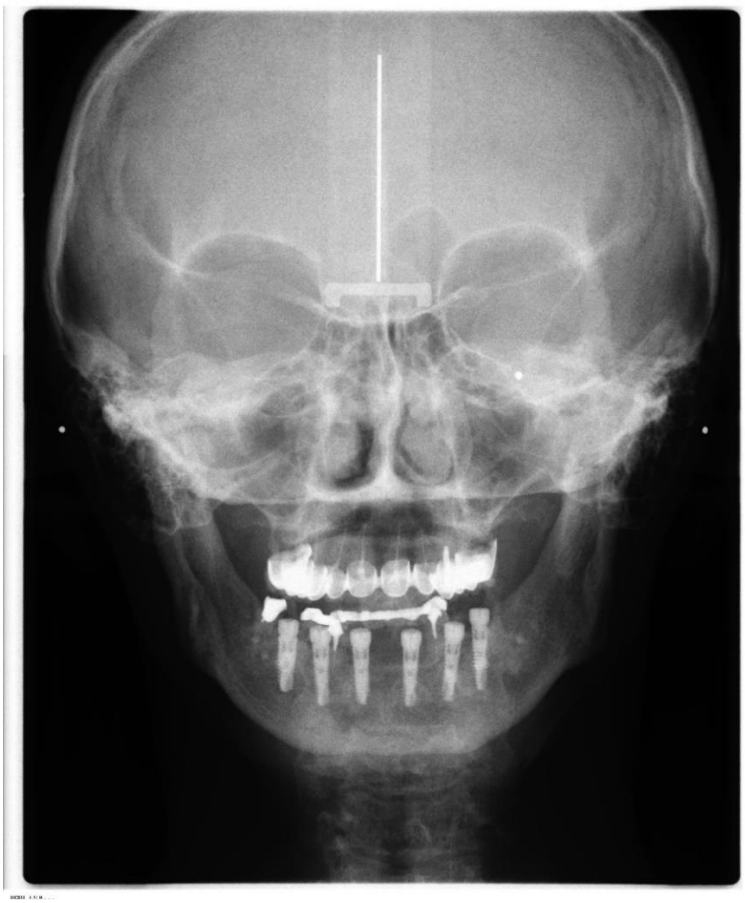


Pic. 30-32. Operating template lower jaw

Implantation

Lateral X ray with implants



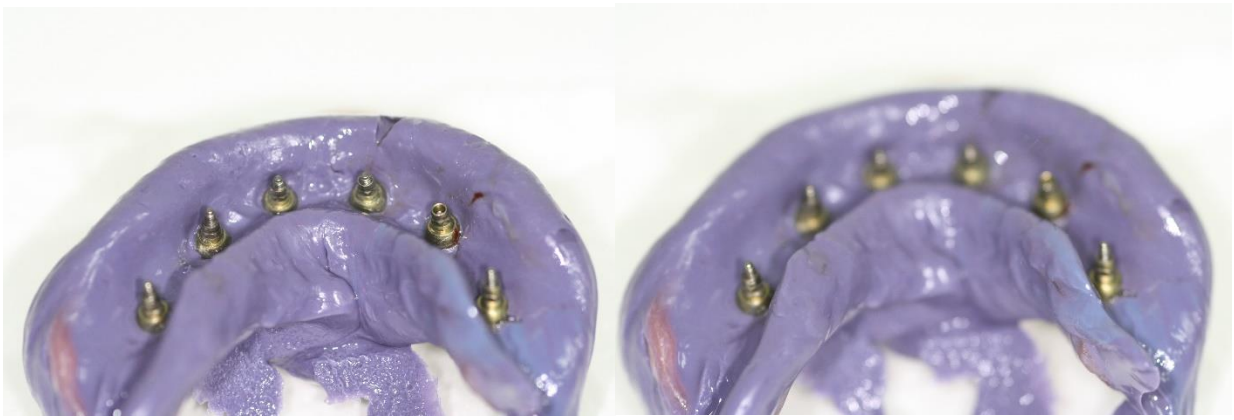


Pic. 33-34. Lateral X ray with implants

Orthopantomography

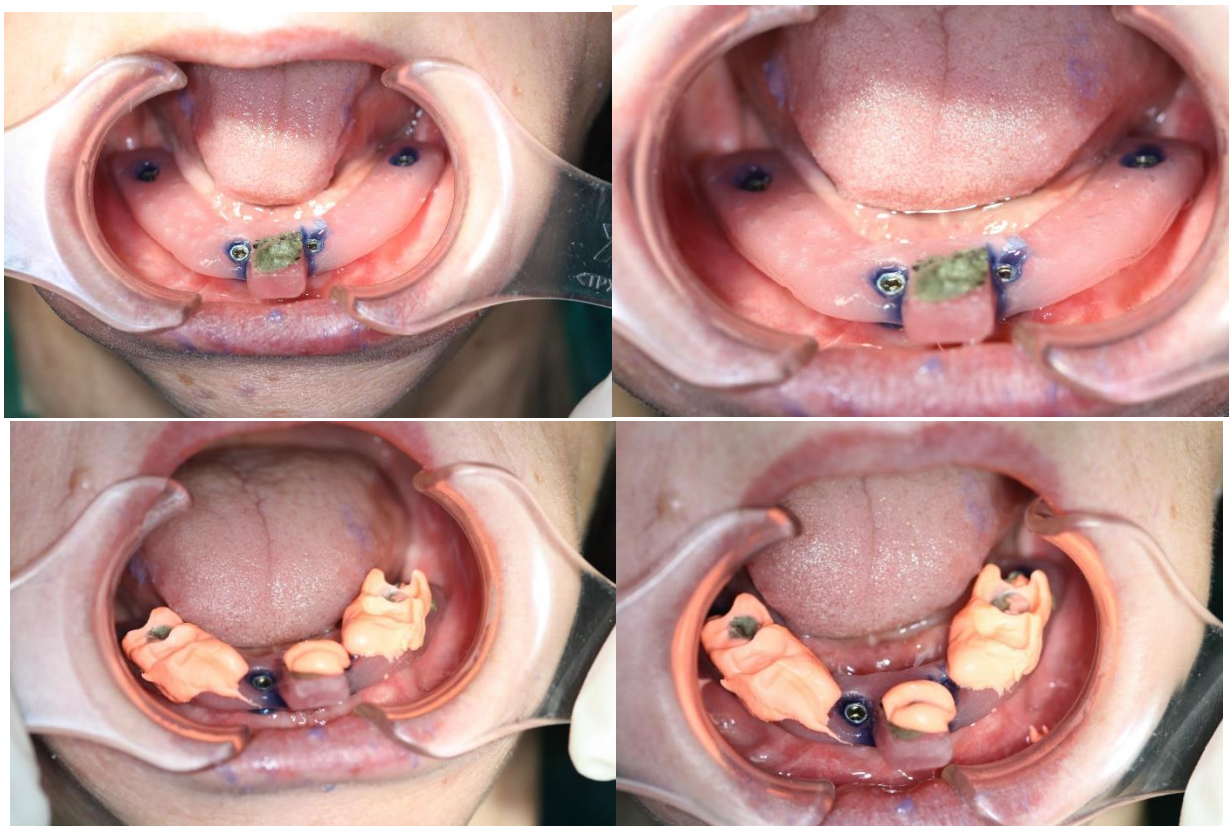
Pic. 35. Lateral X ray with implants

Impressions



Pic. 36-40. Impressions

Centric relation determination

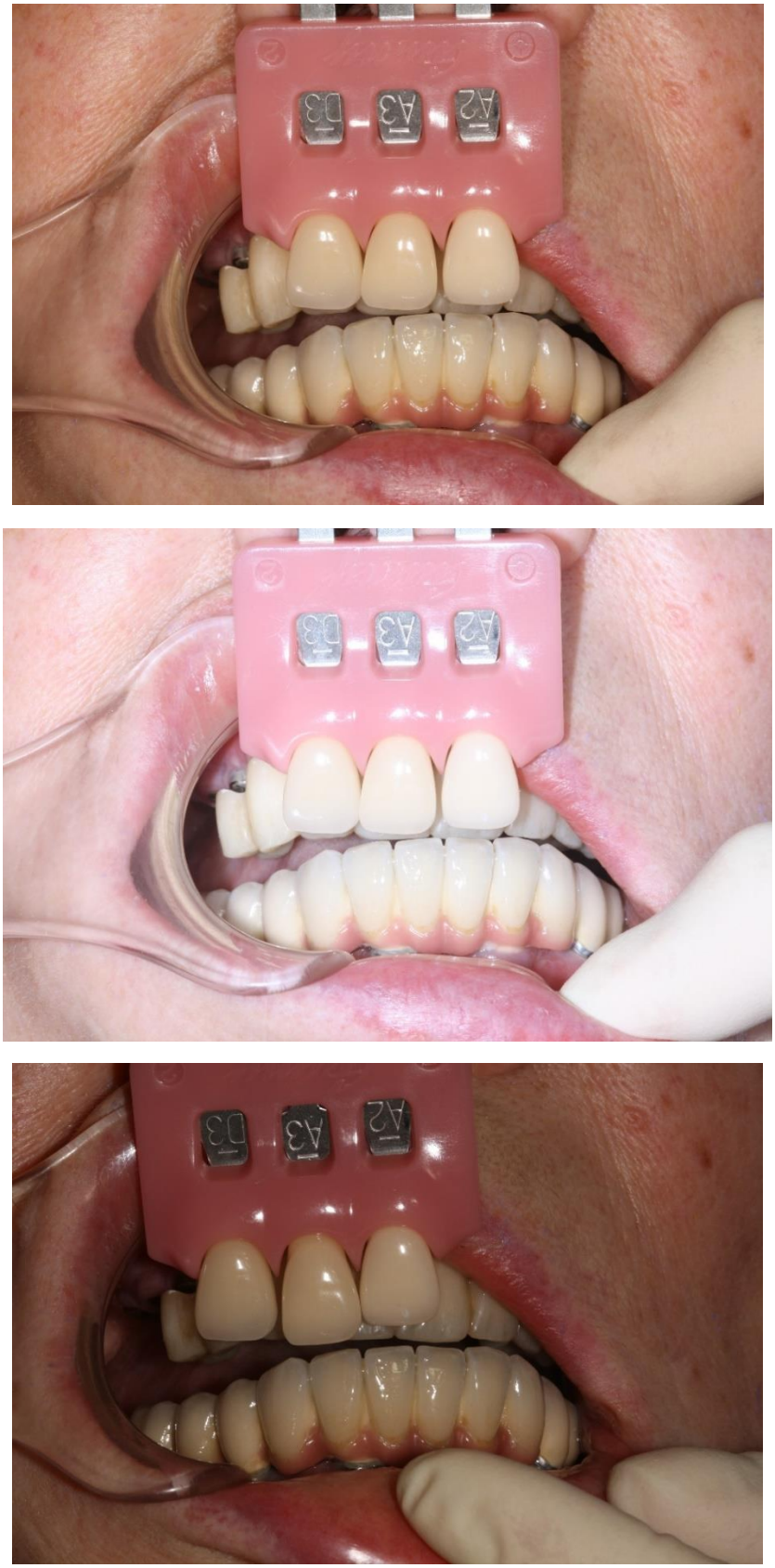


Pic. 41-44. Centric relation determination

Mastering casts and centric relation

Pic. 45-49. Mastering casts and centric relation

Color definition



Pic. 50-52. Color definition

Abutment of the upper jaw

Pic. 53-56. Abutment of the upper jaw

Final result

Pic. 57-59. Final result

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