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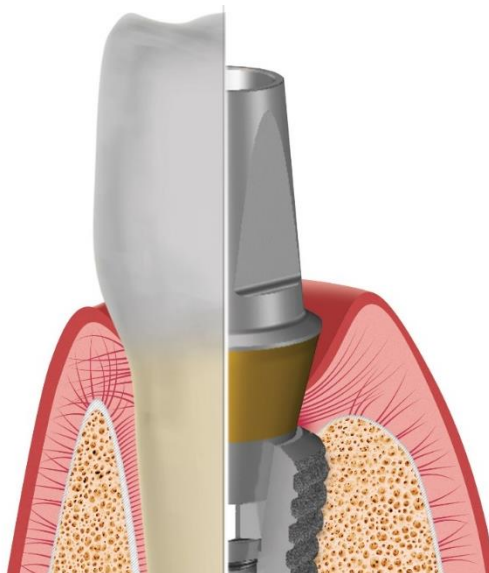
ARSENIE GUȚAN

**Department of
ORAL and MAXILLO-FACIAL SURGERY AND ORAL IMPLANTOLOGY**

MOSTOVEI ANDREI

OPTIONS OF ENDOSSEOUS DENTAL IMPLANT PLACEMENT

*Methodological guide for the 4th year students,
Faculty of Stomatology*



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OPTIONS OF EDNOOSEOUS DENTAL IMPLANT PLACEMENT

Author:

Andrei MOSTOVEI, PhD, Associate professor

Reviewers:

Valentin TOPALO, PhD, University professor

Nicolae CHELE, PhD, University professor

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INTRODUCTION

Development of oral implantology as a part of modern dentistry has brought new tendencies and concepts of rehabilitation of patients with different forms of edentulism. Numerous researches have proved the possibility of full both functional and esthetical arch rehabilitation.

The history of implantology had different periods in which different biomaterials for implant manufacturing were tested, having their micro- or macrodesign modified together with the osseointegration terms.

The golden standard, developed by Branemark based on various researches, have led to the description of the criteria for implant osseointegration [0001]:

1. Implant biocompatibility.
2. Implant design and surface.
3. The hard tissue condition.
4. Surgical technique.
5. Loading conditions.

The scientific and technological progress led to the modification of implant placement methods. Thus the requirements were revised and modified. Oral implantology had turned into an implant-prosthetic rehabilitation with short terms and esthetic and functional results as close as possible to natural teeth due to increased requirements to terms of treatment and high-esthetic expectations of patients.

This methodological guide is intended for the 4th year students in the 8th semester, Faculty of Stomatology, with a purpose to increase the quality of teaching and understanding of this subject.

Theme 1: Instruments and devices used in oral implantology. Medical chart of patients with dental implants. Presentation of implant types and their components.

Aim: To know the basic instruments and devices used in oral implantology, and specific character of record keeping of in patients with dental implants.

Duration and activity type: According to the syllabus of the discipline 9 academic hours are allocated for the theme “Instruments and devices used in oral implantology. Medical chart of patients with dental implants. Presentation of implant types and their components”, namely: 2 hours – lectures, 7 hours - seminars and practical exercise.

Theme objectives:

1. Analysis of the conditions and endowment of the surgery office for implant placement procedures.
2. Evaluation of implant surgical kit and Physio Dispenser.
3. Instruments and devices for implant placement.
4. Medical chart of patients with implants, the required data for dynamic evaluation of patients.
5. Implant types and their components.

Material and methods

The theoretical material is provided in a classical manner through lectures and seminars.

Practical classes complete mastering the theoretical material through the evaluation of instruments used in oral implantology; demonstration of the Physio Dispenser, its purpose and applied methods; analysis of implant surgical kits; patient medical chart; legal aspects of oral implantology (information consent);

analysis of one- and two-piece implants with their design characteristics and indications; evaluation of macro- and micro-design of implants; importance of surface and connection types of implants for implant-prosthetic rehabilitation.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, PowerPoint presentations.

Self-assessment questions:

1. Characterize the requirements to the surgical/ oral implantology office.
2. List the instruments required for implant placement procedures.
3. Describe the aim and application mode of the Physio Dispenser.
4. Prophylactic regimes that must be complied with in patients with oral implant surgeries the preparation of surgeons for dental implant placement.
5. Classification of implants depending on the number of components.
6. Characteristics of implant types applied in modern oral implantology.
7. Advantages of screw type implants versus plate-like or subperiosteal implants.
8. Materials and alloys used in manufacturing of endosseous dental implants.

Theme 2. Local and general aspects in patients subjected to implant placement surgery. Clinical and anatomical evaluation of dental arches, soft and hard tissue conditions.

Aim: To learn the methods and specific characteristics of the examination of patients in oral implantology.

Duration and activity type: According to the syllabus of the discipline 10 academic hours are allocated for the theme “Local and general aspects in patients subjected to implant placement surgery. Clinical and anatomical evaluation of dental arches, soft and hard tissue conditions.”, namely: 3 hours – lectures, 7 hours - seminars and practical exercise.

Theme Objectives:

1. Evaluation of paraclinical examinations used for the evaluation of the general health status of patients subjected to surgery.
2. Evaluation of local conditions as quality and quantity of soft and hard periimplant tissues.
3. Identification of risk factors in dental implantology.

Material and methods

Theoretical material is given in a classical manner through lectures and seminars.

While studying this theme, the students learn the quantitative (Carl E. Misch) and qualitative bone volume (Carl E. Misch, Leckholm and Zarb), soft tissue evaluation in the implant area, importance of dental-periodontal status evaluation, main and auxiliary paraclinical methods used in implant-prosthetic treatment planning.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, PowerPoint presentations.

Self-assessment questions:

1. Explain the importance of periodontal pocket assessment in implant-prosthetic treatment planning.
2. List the types of quantitative bone volume according to Carl E. Misch classification.
3. Explain the features of bone density in different areas of the jaws according to Misch, Lekholm and Zarb.
4. Requirements to implant design and size depending on the edentulous area.
5. The role of soft tissue volume in implant-prosthetic rehabilitation.
6. Dental-periodontal factors that influence the implant-prosthetic treatment.

Theme 3. Paraclinical evaluation of periimplant conditions. Implant-prosthetic treatment planning. Application of surgical guides for dental implant placement.

Aim: To evaluate correctly the anatomical conditions of edentulous areas and correlate the clinical examination with paraclinical data for implant-prosthetic treatment planning.

Duration and activity type: According to the syllabus of the discipline 12 academic hours are allocated for the theme “Paraclinical evaluation of periimplant conditions. Implant-prosthetic treatment planning. Application of surgical guides for dental implant placement”, namely: 4 hours – lectures, 8 hours - seminars and practical exercise, 2 hours- individual work.

Topic Objectives:

1. Diagnosing based on clinical and paraclinical x-ray investigations (Orthopantomography, cone beam computed tomography).
2. Determination of study casts and virtual planning in implant-prosthetic rehabilitation.
3. Risk assessment in implant-prosthetic planning.

Material and methods

The theoretical material is provided in a classical manner through lectures and seminars.

While studying this theme, the students are trained to evaluate the restorative space; assess the importance of study casts and digital impression in treatment planning; evaluate the results of paraclinical examinations (Orthopantomography, cone beam computed tomography) and combine them with clinical data; plan the number and sizes of implants depending on the restorative space (Carl E. Misch classification – FP1-RP5), edentulous space and biomechanics of future implant-supported restoration; determine the anatomical and surgical risks during the planning phase; be able to assess the bone density based on CBCT; plan the implant-prosthetic rehabilitation method using CBCT

and clinical findings; understand the general principles of performing surgical guides and their aim.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, PowerPoint presentations.

Self-assessment questions:

1. The role of restorative space in implant-prosthetic treatment planning.
2. Determination of implant number depending on biomechanics in oral implantology.
3. The required axis and position of implants toward the replaced teeth.
4. The required bone volume for implant placement.
5. The role of the implant-crown ratio in planning of the number and sizes of implants.
6. Anatomical landmarks that have to be considered when choosing the implant size.
7. The role of study casts and digital impressions in implant-prosthetic treatment planning.
8. Guided surgery, definition and its role in implantology.
9. The role of risk assessment factor, its importance.
10. Criteria for selecting the appropriate paraclinical investigation (OPG or CBCT)
11. The relevance of OPG and CBCT in the determination of sinus pathology.
12. The appropriate paraclinical investigations for bone volume assessment in the vestibular-oral aspect.

Home assignment: to draw up an implant-prosthetic treatment plan based on the received CBCT images of patients and present it in the form of a project in the subsequent classes (in groups of 2-3students).

Theme 4. Diagnostic features, indications and contraindications in oral implantology. History of oral implantology. Osseointegration. Success and survival rates. Conventional method of implant placement (Branemark). The concept of biological width. Implant stability and assessment methods

Aim: to learn the diagnostic peculiarities, indications and contraindications as well as basic steps for implant placement and their evaluation during healing and post-prosthetic periods.

Duration and activity type: According to the syllabus of the discipline 11 academic hours are allocated for the theme “Diagnostic features, indications and contraindications in oral implantology. History of oral implantology. Osseointegration. Success and survival rates. Conventional method of implant placement (Branemark). The concept of biological width. Implant stability and assessment methods”, namely: 3 hours – lectures, 8 hours - seminars and practical exercise.

Theme Objectives:

1. Determination of indications and contraindications to implant placement.
2. Evaluation of biological processes in periimplant tissue regeneration.
3. Analysis of conventional implant placement method and stability parameters.

Material and methods

The theoretical material is provided in a classical manner through lectures and seminars.

While studying this theme, the students learn implant placement surgical risks in patients with different concomitant pathologies; the ASA classification (American Society of Anesthesiologists) of patient health; pathologies which are absolute or relative contraindications to dental implant placement; implant-prosthetic rehabilitation of patients with valvulopathies and the patients under

antithrombotic therapy or bisphosphonates; antibiotic prophylaxis in implant-prosthetic rehabilitation; the main steps in conventional implant placement and their evaluation during the healing period; osseous and gingival integration of implants; stability, success and survival rates of implants.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, PowerPoint presentations.

Evaluation of individual work: students present the projects during practical classes. All these presentations will be subjected to debates among students with determination of advantages and disadvantages of proposed methods of rehabilitation.

The performed individual work is evaluated by the teacher with the assessment of clinical thinking of students during the debates.

Self-assessment questions:

1. List the local contraindications to implant placement.
2. List the general contraindications to dental implant placement.
3. The risks in patients under the antithrombotic therapy.
4. The risk in patients under bisphosphonate therapy.
5. The indices for hemorrhagic risk assessment in patients under antithrombotic therapy.
6. The appropriate period that is required to pass after a heart-attack in order to perform a safe implant placement.
7. Parameters characterizing the implant stability.
8. Primary vs secondary implant stability.
9. Osseointegration concept. Definition.
10. Biological width and its components.
11. Success and survival implant criteria.
12. Conventional implant placement technique.

Theme 5. Current surgical techniques in oral implantology. Post-extraction implant placement.

Aim: Evaluation of different method of implant placement and at different post-extraction terms.

Duration and activity type: According to the syllabus of the discipline 12 academic hours are allocated for the theme “Current surgical techniques in oral implantology. Post-extraction implant placement.”, namely: 4 hours – lectures, 8 hours - seminars and practical exercise, 1hour – individual work.

Theme Objectives:

1. Dental implant placement in one and two surgical steps.
2. The implant-crest relation in periimplant hard tissue remodeling.
3. Implant placement at different time periods after tooth extraction.

Material and methods

Theoretical material is provided in a classical manner through lectures, seminars, practical lessons and hand-on sessions.

While studying this theme, the students learn the methods of implant placement in one and two surgical steps; flap and flapless methods; tissue healing evaluation during osseointegration period; features of implant exposure in the oral cavity; the structure and role of periimplant biological width creation; basic prosthetic steps and periimplant bone monitoring; immediate loading using all on 4 and 6 implants protocols; features of implant placement at different post- extraction terms (immediate, early and conventional placement); requirements to the post-extraction socket for immediate implant placement (Elian and Khan dental socket classification); oral wound regeneration.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, CBCT software, PowerPoint presentations.

Practical activity: dental implant placement on an acrylic demountable model (in simulation rooms).

Evaluation of individual work: during practical classes and seminars the students (groups of 2-3 people) continue their project presentation. All presentations are subjected to debates for the students, with the determination of advantages and disadvantages of the proposed methods of rehabilitation.

The performed individual work is evaluated by the teacher with the assessment of clinical thinking of students during the debates.

Self-assessment questions:

1. Advantages of 2 surgical steps implant placement.
2. Disadvantages of 2 surgical steps implant placement.
3. Advantages of 1 surgical step implant placement.
4. Disadvantages of 1 surgical step implant placement.
5. Advantages of flapless implant placement.
6. Disadvantages of flapless implant placement.
7. Differences between early type 1 and 2 implant placement.
8. The main conditions required for the post-extraction implant placement.

Theme 6. Biomaterials in implantology, properties and indications for the use. Surgical techniques for guided bone reconstruction of deficient alveolar ridges.

Aim: the evaluation of biomaterials used in oral implantology as well as surgical options of hard and soft tissue reconstruction.

Duration and activity type: According to the syllabus of the discipline 11 academic hours are allocated for the theme “Biomaterials in implantology, properties and indications for the use. Surgical techniques for guided bone reconstruction of deficient alveolar ridges”, namely: 3 hours – lectures, 8 hours - seminars and practical exercise, 2 hours – individual work.

Theme Objectives:

1. Evaluation of requirements for the biomaterials used in oral implantology.
2. Analysis of biomaterials in dependence on their origin.
3. Description of bone volume reconstruction.

Material and methods

The theoretical material is provided in a classical manner through lectures, seminars, practical classes and hand-on sessions.

While studying this theme, the students learn the basic requirements for the biomaterials used in oral implantology; types of biomaterials in dependence on their role (collagen, reinforced and titanium membranes, bone grafting materials, mucografts), types of biomaterials in dependence on their origin (autograft, allograft, xenograft, synthetic); indications for the application of biomaterials, the risks of their use, intra- and extraoral donor sites, their specific characteristics, advantages and disadvantages, criteria to evaluate the type of the required biomaterials; PRF and PRP technology and their role in implantology, methods of GBR using autograft or other types of graft; horizontal and vertical guided bone regeneration; osseo-splitting, advantages and disadvantages of different GBR methods; Khoury technique; lateralization of the inferior alveolar nerve;

mucosal grafting and indications for it; piezosurgery and its advantages, principles of Piezotome application.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, CBCT software, PowerPoint presentations.

Evaluation of individual work: during practical classes and seminars the students (groups of 2-3 people) continue their project presentation. All presentations will be subjected to debates for the students, with the determination of advantages and disadvantages of the proposed methods of rehabilitation.

The performed individual work is evaluated by the teacher with the assessment of clinical thinking of students during the debates.

Problem based learning/ Clinical case problems: during the classes, the teachers offer the students 1-2 clinical case problems with the data about the case given in stages and train the students work in team. The problem is dealt with in 2 separate classes, thus enabling the individual work of the students and the final solution is presented in the second class.

Clinical case problem: in the class the students can be given CBCT (with/without intraoral images) or case problems in order to give the students the possibility to analyze the case by themselves, and to make a diagnosis and treatment planning. The results can be discussed with the other students in order to make a critical evaluation of the studied rehabilitation methods (see the Annex).

Self-assessment questions:

1. Characteristics of xenogenic graft.
2. The role of the collagen membranes.
3. Types of grafting materials with osteoinductive properties.
4. Contraindications for GBR.
5. Extraoral bone donor sites.

6. Intraoral bone donor sites.
7. Difference between the grafts taken from the mandible bone and the iliac crest.
8. Bone substitution characteristics.
9. Specific features of biocompatibility.
10. Osseo-splitting technique.
11. Requirements for mucoperiosteal flaps in GBR.
12. Advantages of GBR with xenograft.
13. Disadvantages of GBR with xenograft.
14. Risks of inferior alveolar nerve lateralization.
15. Grafting materials with the lowest rate of bone substitution.
16. Contraindications for GBR.
17. Requirements for GBR with simultaneous implants placement.
18. The role of collagen membrane use.

Theme 7. Surgical techniques of sinus lifting in oral implantology.

Aim: the analysis of implant-prosthetic rehabilitation in the posterior atrophic region of the upper jaw.

Duration and activity type: According to the syllabus of the discipline 10 academic hours are allocated for the theme “Surgical techniques of sinus lifting in oral implantology”, namely: 3 hours – lectures, 7 hours -seminars and practical exercise, 2 hours – individual work.

Theme Objectives:

1. Anatomical and topographic features of the maxillary sinus.
2. Subantral residual bone atrophy.
3. Indications and contraindications for sinus lifting surgery.
4. Evaluation of the techniques and specific characteristics of sinus lifting.

Material and methods

The theoretical material is provided in a classical manner through lectures, seminars, practical classes and hand- on sessions.

While studying this theme, the students learn the basic requirements for anatomical features of the maxillary sinus, implant-prosthetic treatment planning in dependence on the subantral residual bone height (Misch SA classification), indications and the techniques of crestal (Summers) and lateral sinus floor elevation (*LSFE*, conventional antrostomy, grind out, out- fracture, repositioning window techniques); biomaterials used in *LSFE*, their advantages and disadvantages, risks and complications in lateral and crestal sinus lifting.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, CBCT software, PowerPoint presentations.

Evaluation of individual work: during practical classes and seminars the students (groups of 2-3 people) continue their presentation of projects. All

presentations are subjected to debates for the students, with the determination of advantages and disadvantages of the proposed methods of rehabilitation.

The performed individual work is evaluated by the teacher with the assessment of clinical thinking of students during the debates.

Self-assessment questions:

1. Indications for sinus floor elevation.
2. Contraindications for sinus floor elevation.
3. Steps of crestal sinus lifting.
4. Steps of lateral sinus lifting.
5. Advantages of crestal sinus lifting.
6. Advantages of lateral sinus lifting.
7. Disadvantages of lateral sinus lifting.
8. Risks and complications in crestal sinus lifting.
9. Risks and complications in lateral sinus lifting.
10. Radiological examinations required for sinus lifting planning.

Theme 8. Accidents, incidence and complications in oral implantology. Loading protocols.

Aim: Evaluation of accidents and complications which can appear in oral implantology and their management.

Duration and activity type: According to the syllabus of the discipline 9 academic hours are allocated for the theme “Accidents, incidence and complications in oral implantology. Loading protocols ”, namely: 2 hours – lectures, 7 hours -seminars and practical exercise, 2 hours – individual work, 1 hour – individual work.

Theme Objectives:

1. Evaluation of complications according to the time of their appearance.
2. Classification of biological and mechanical accidents and complication.
3. Prophylaxis and management of accidents and complications in oral implantology.

Material and methods

The theoretical material is provided in a classical manner through lectures, seminars, practical classes and hand-on sessions.

While studying this theme, the students learn: local and general accidents and complications, complications developing throughout the surgery and postoperative complications (early implant exposure, early failure, peri-implantitis, mucositis), postprosthetic complications, biological and mechanical complications; Mombelli plaque and bleeding indexes; Tal classification of early implants exposure, prophylaxis and management of complications; indications and conditions of functional loading of implants.

Different semiotic systems like scientific language, graphic and computerized languages are used for teaching and learning of this theme.

Didactic materials used: tables, schemes, pictures, video material, CBCT software, PowerPoint presentations.

Evaluation of individual work: during practical classes and seminars the students (groups of 2-3 people) continue their presentation of projects. All presentations are subjected to debates for students with the determination of advantages and disadvantages of the proposed methods of rehabilitation.

The performed individual work is evaluated by the teacher with the assessment of clinical thinking of students during the debates.

Self-assessment questions:

1. Name the accidents and complications which can appear during the surgery.
2. Name the postoperative accidents and complications.
3. Biological postprosthetic complications.
4. Mechanical complications.
5. Causes of periimplantitis.
6. Mechanical complications during the surgery.
7. Etiology of early implant exposure.
8. Treatment of early implant exposure.
9. Characteristics of neuropraxia.
10. Characteristics of neurotmesis.
11. Characteristics of axonotmesis.
12. Conditions for immediate loading of implants.
13. Conditions for delayed loading of implants.

Bibliography

A. Mandatory:

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2. Block M. S. Color Atlas of Dental Implant Surgery. Third Edition, Saunders Elsevier, 2011.

Minimal practical skills:

- Planning of the clinical and paraclinical assessment of patients;
- Implant-prosthetic rehabilitation methods learning;
- Determination of treatment options and postoperative care of the patients.

Case problem.

A 58- years-old patient consulted the dentist with the following complaints: missing teeth, periods of pain in the right inferior molar and premolar. Beside these, the patient required an implant-prosthetic rehabilitation. The anamnesis information is: dental treatment was carried out over 5 years ago, the bridge from the 2nd quadrant had fallen 5 days prior to the visit to the dentist, no other general pathology revealed. Endobuccal examination: missing teeth in the posterior upper left region, bridges in the region of the 1st, 3rd and 4th quadrant. Tooth 27 (FDI) with total crown lesion, no hard support on the roots. The ceramic crowns in the 4th quadrant are not esthetic. X-ray examination in the figures 1 and 2.

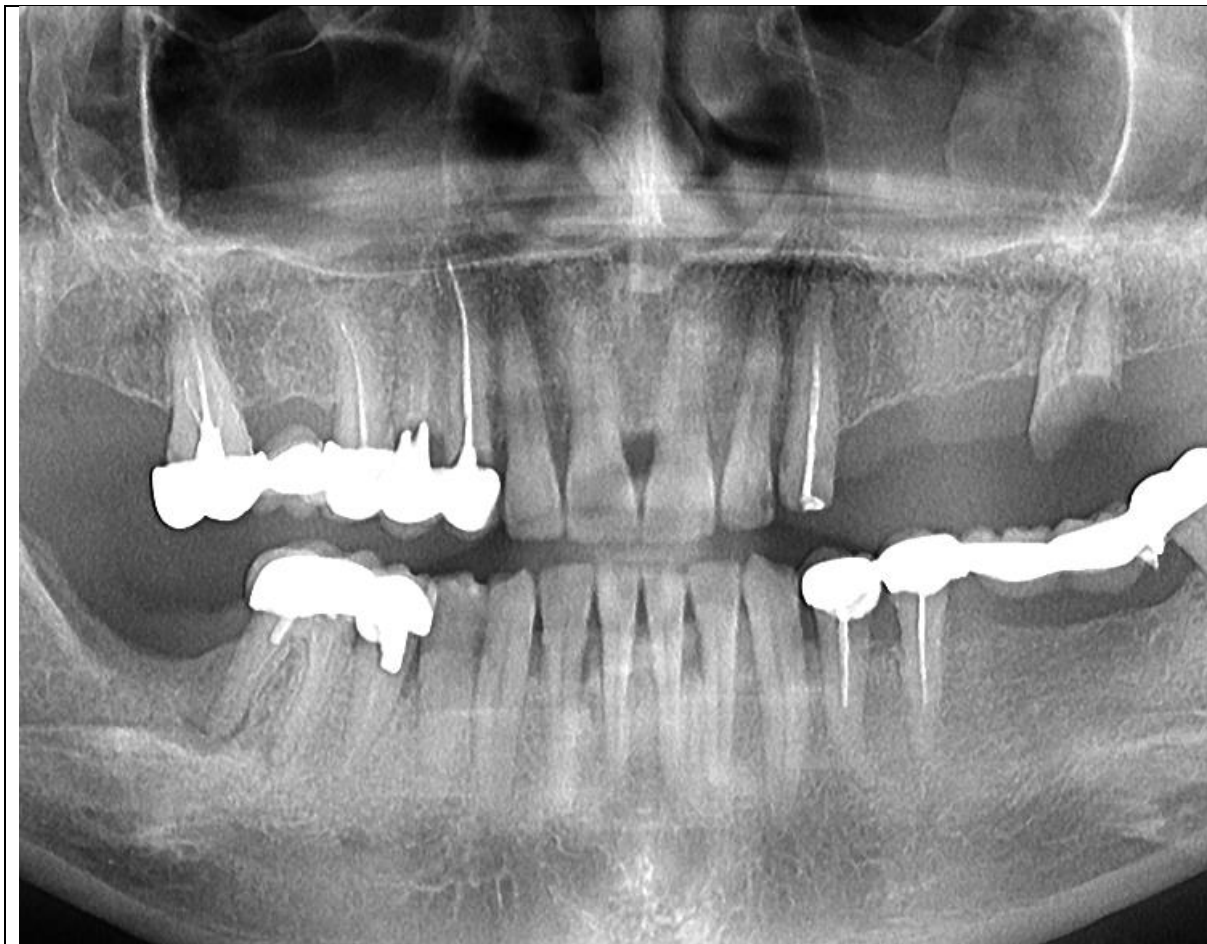


Fig. 1. Fragment from Panoramic X-ray.

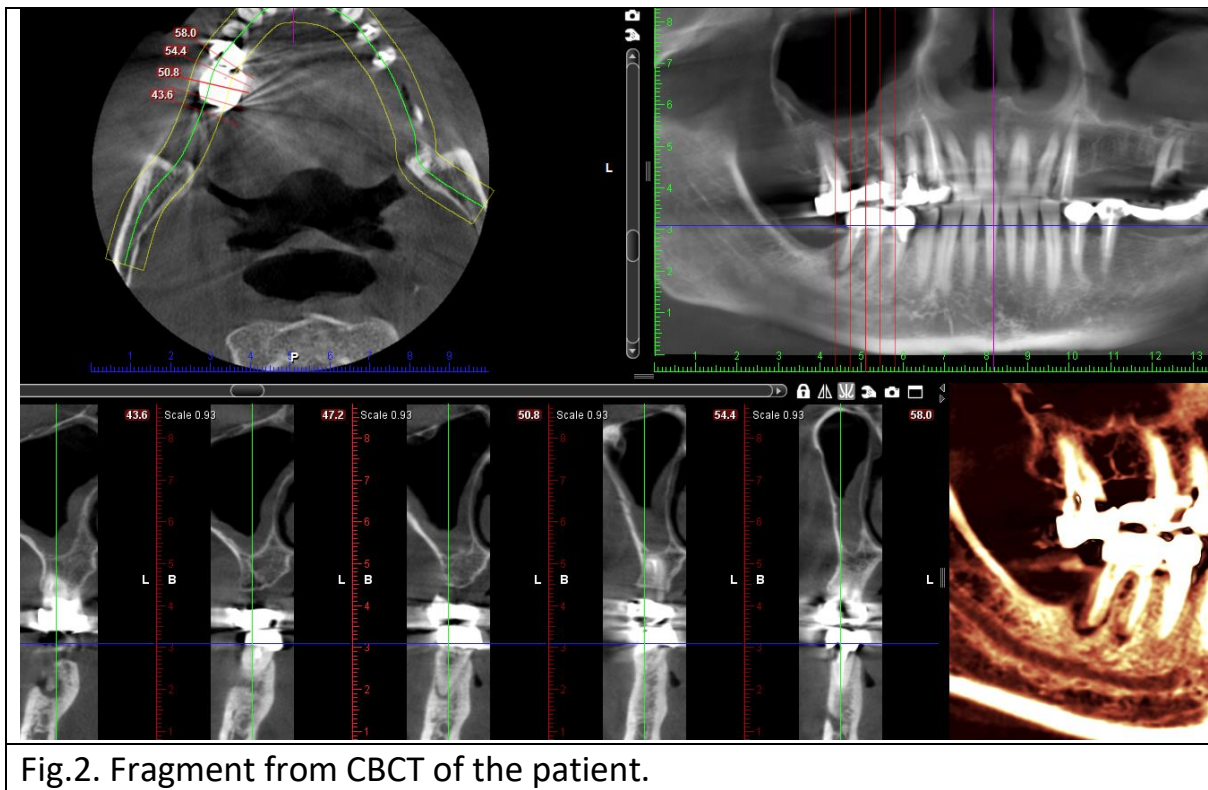


Fig.2. Fragment from CBCT of the patient.

Requirements:

1. Make the preliminary diagnosis to the patient.
2. Explain the preliminary diagnosis.
3. Describe the radiological images and make the differential diagnosis.
4. What complementary investigations can be required for the patient (if it is necessary)?
5. Make the clinical diagnosis.
6. Explain the treatment planning for the patient based on the presented information.
7. What other treatment may be required for this patient?