

**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI - 600 032.**



**M.D.S. BRANCH – V
ORTHODONTICS**

M.D.S. – BRANCH V - ORTHODONTICS

It was recommended that in addition to the existing D.C.I. and M.G.R. University Regulations, the following changes may be made:

- 1) The Answer Papers of the Part – I University Examination will be evaluated by teachers handling Part – I M.D.S. Basic Science classes and not by teachers who do not conduct classes for M.D.S. students.
- 2) The students should submit a logbook at the time of final examination in which the work done during the postgraduate programme must be recorded and duly attested by the Head of the Department.
- 3) Dissertation should be submitted at the end of 30 months or 6 months prior to appearing for the Part – II examination.
- 4) Examination will consist of 4 papers.

PAPER – I : Applied Basic Sciences

**PAPER – II : Growth and Development Basics in Orthodontics,
Diagnosis & Radiology.**

**PAPER – III : Biomechanics & Tissue Changes, Orthodontic
Techniques & Treatment Planning.**

PAPER – IV : Recent Advances in Orthodontics-Essay.

PAPER EVALUATION:-

The answer scripts must be evaluated by the Internal and External examiners at the time of practical examinations and central evaluation should not be encouraged if the University is not inclined to dispense with central evaluation, the paper evaluation must be done prior to announcing the dates of practical examination and only those candidates who have secured a pass in the theory should be permitted to appear for the practical examination.

PRACTICAL EXAMINATION :-

Will comprise of display of 5 treated cases with complete records, short and long case presentation, viva, dissertation discussions and practical wire bending.

- 6) The current system of entering marks and T.M.R. to be continued.

BRANCH V - ORTHODONTICS

Paper II: Growth and Development, Basic in Orthodontics, Diagnosis and Radiology

- 1) Growth pattern, variability and timings.
- 2) Methods of studying physical growth – Measurement approach – Experimental approach :
 - Nature of skeletal growth.
 - Primary cartilage.
 - Secondary cartilage.
 - Growth center.
 - Growth site.
- 3) Pre natal growth – Cranial vault :
 - Cranial base.
 - Maxilla.
 - Mandible.
- 4) Post natal growth – Cranial Vault :
 - Cranial base.
 - Maxilla.
 - Mandible.
- 5) Wolfe's law of transformation.
- 6) Trajectories of forces.
- 7) Theories of growth – Genetic theory :
 - Sutural theory.
 - Cartilage theory.
 - Functional Matrix theory.
 - Enlow's V principle.
 - Van Limborg theory.
 - Cybernetics.
 - Servosystem – Auxological groups – Arborization – Drift versus displacement.
- 8) Growth rotations.
- 9) Implications of growth.
- 10) Growth spurts.

- 11) Early stages of development – Embryologic development :
 - Late foetal development and birth.
- 12) Infancy and early childhood :
 - The primary duration years.
 - Physical development in preschool years.
- 13) Maturation of oral function – Buccinator mechanism :
 - Infantile swallow.
 - Transitional swallow.
 - Adult swallow – Eruption of primary teeth late childhood – Physical development in late childhood – Exception of permanent teeth – Space relationship in replacement of incisors – incisor liability – Space relationship in replacement of canine and primary molar – Development of dentition – Normal occlusion – Development of occlusion – Skeletal maturity indicators.
 - Cervical vertebra.
 - Hand wrist X-ray methods.
 - Miscellaneous.
- 14) Later stages of development – Adolescence :
 - Early permanent dentition.
 - Limitation of adolescence.
 - Timing of puberty – Growth patterns in dentofacial complex.
 - Dimensional changes.
 - Rotation of jaws – Maturation and ageing.
 - Changes in teeth and supporting structure.
 - Changes in alignment and occlusion soft tissue changes in ageing – Facial growth in adults – Development of palate and clinical implications – Development of tongue – Development of cleft palate – Dynamics of facial growth – Differential growth – Functions of the stomatognathic system – Development of T.M.J. – Maturation of orofacial musculature.
 - Orofacial muscles.
 - Basic concepts of oro facial neuromuscular physiology.
 - Reflex determinants of mandibular registration position.
 - Growth and adaptation of orofacial muscles – Interaction of orofacial muscles with development of craniofacial skeletal and dentition – Role of craniofacial skeletal growth in Orthodontics – Growth prediction – Arcial growth – Malocclusion associated with syndrome – Mandibular skeletal

jaw dysmorphology – Mechanism of bone growth – Mechanism of bone transformation – Embryologic origin of the cartilage replacement mechanisms of the head – Law of electrogenesis – Synchondroses – Principles of bone growth – Theories of tooth eruption – Functional Matrix revisited – Mitosis – Meiosis – Recent advances.

15) Anthropology :

- Ontogeny.
- Phylogeny.
- Evolution of human face.
- Evolution of T.M.J.
- Evolution of mandible.
- Vestigial organs.
- Evolution of dentition.
- Dryopaethicus.
- Anthropometric studies.

16) Nutrition :

- Role of vitamins.
- Role of hormones.
- Calcium and phosphorus homeostasis.
- Enzymology.
- Balanced diet.
- Role of nutrition.
- Nutrition of malocclusion.

Paper III: Bio Mechanics, Tissue changes, Orthodontic Techniques and treatment planning.

1) Genetics :

- Principles and terminology.
- Laws of inheritance.
- Mode of inheritance.
- Twin studies.
- Mutation.
- Recent advances in genetics and molecular biology.
- Role of homeobox genes.
- Molecular genetics in oral and craniofacial dysmorphology.
- Heritability of skeletal malocclusion.
- Heritability of local occlusal variables.
- Genetic influence on tooth number, size and morphology.
- Clinical implications.

- Chromosomal aberrations.
 - Recent advances.
- 2) Radiology :
- Properties of X-rays.
 - Evolution of X-rays.
 - X-ray film.
 - Bitewing.
 - IOPA – (i) Paralleling, (ii) Bisecting angle techniques.
- 3) General Radiology :
- Radiation Hazards.
 - Radiation Protection.
 - Xero Radiography.
 - O.P.G.
 - Focal trough.
 - T.M.J. imaging.
 - C.T. scan.
 - M.R.I. scan.
 - Soft tissue filter.
 - Collimator, grids and intensifying screens.
 - Radiographic diagnosis of impacted tooth.
 - Shift cone technique.

CEPHALOMETRY -

- 1) Significations of Radiographic Cephalometry :
- Contribution factors to facial disharmony.
 - Limitations of classification of malocclusion from dental cases.
 - Incisor inclination.
 - Importance of differential diagnosis in Class – II and Class – III.
 - Growth and Maturation.
- 2) Twenty centuries of Cephalometry :
- Classifying physique.
 - Measurement and Proportion.
 - Renaissance to Twentieth Century.
 - The Divine proportion.
 - A search for an ideal.

- 3) Radiographic Cephalometric techniques :
 - Factors affecting Cephalometric Radiographs.
 - Patient positioning.
 - X-ray grids.
 - Film / screen combinations.
 - X-ray generators.
 - Film processing.
 - Radiographic protection principles.
- 4) Tracing Techniques and identification of landmarks :
 - Tracing techniques.
 - Identification of Cephalometric landmarks.
- 5) Downs Analysis.
- 6) Steiner Analysis.
- 7) Ricketts Analysis.
- 8) Wits Appraisal.
- 9) Mc. Namara Analysis.
- 10) Pitchfork's Analysis.
- 11) Bjork's Analysis.
- 12) Tweed's Analysis.
- 13) Schwarz Analysis.
- 14) COGS Analysis.
- 15) The Geometry of Cephalometry.
- 16) The complexity of facial growth analysis :
 - Analysis of growth changes.
 - Prediction.
- 17) Superimposition of Cephalometric Radiographs :
 - Natural head position – The key to Cephalometry.
- 18) The continuous and Dynamic measurement of Natural Head posture and position.

- 19) Proportional Analysis of the human face in a mesh coordinate system.
- 20) Template Analysis.
- 21) The Proportional template.
- 22) Soft tissue evaluation :
 - Frontal view.
 - Profile view.
- 23) The Holdaway soft tissue analysis.
- 24) Advances in Cephalometric prediction.
- 25) Videocephalometry.
- 26) Facial analysis in two and three dimensions.
- 27) Reliability of Cephalometric prediction.
- 28) Records and transfer case guidelines :
 - Guidelines for Temporomandibular dysfunction assessment.
- 29) Possibilities and limitations of various Cephalometric variables.
- 30) Sources of Error in Cephalometry.
- 31) Postero anterior (frontal) Cephalometry.
- 32) Finding Pathology in Cephalometric Radiographs.
- 33) Clinical Research Applications of Cephalometry.
- 34) Cephalometric Assessment of Craniocervical angulation.
- 35) Pharyngeal relationships, soft palate dimensions, hyoid bone and tongue position.
- 36) Other Analyses :
 - Colben craniofacial and dentition Analysis.
 - Di Paolo's Quadrilateral Analysis.
 - Farkas and coworkers Analysis.
 - Harvold Analysis.
 - Hassund (Bergen) Analysis.

- Jarabak Analysis.
- Legan and Burrstone soft tissue Analysis for Orthodontic Surgery.
- Ricketts comprehensive computer description analysis.
- Riedel Analysis.
- Sassouni Analysis.
- Wylie Analysis.
- Arnett and Bergman soft tissue Analysis.

37) Soft Tissue Analysis :

- Profile Analysis.
- Reference points used in profile analysis.
- Assessment of total profile.
- Lip Analysis.
- Reference planes for lip profile assessment analysis of tongue position by cephalometric radiology.
- Analysis of tongue position by cephalometric radiography.
- Tongue parametes.
- Average findings.
- Functional Analysis based on Cephalometric Radiography.

38) Cephalometric Radiography and Growth :

- Prediction of growth.
- Methods of prediction of growth.
- Sources of Error in growth prediction.
- Post Treatment growth changes.
- Fine adjustment of occlusion after treatment.
- Holdaway growth prediction.

CHILD PSYCHOLOGY -

1) Learning and development of behaviour :

- Classical conditioning.
- Operant conditioning.
- Observational conditioning.

2) Stages of emotional and cognitive development :

Emotional development:-

- Sigmund Freud's Psychoanalytic theory of personality development.
- Erik Eriksson's eight stages of emotional development.

Cognitive development:-

- Jean Piaget's
- Assimilation and accommodation.
- Four periods of cognitive development.
- Sensorimotor.
- Pre operational.
- Concrete operational.
- Period of formal operations.
- Elkinel imaginary audience.
- Personal fable.

Behavioural Sciences:-

- The adolescent patient.
- The compliant adult patient.
- The orthodontist.

Social Psychology of Orthodontics.

Orthodontic motivational Psychology.

Educational Psychology :

- Learning patterns.
- Sensitivity threshold.
- Patient-oriented Approach.

Psychologic outcomes of Orthodontic treatment :

- Self-concept.
- Self-esteem.
- Body images.

Management of handicapped child in Orthodontic office.

Kinds of Behaviour :

- Fear.
- Anxiety.
- Cry.

Behaviour Rating Scales.

Psychological aspects of Habits.

Child abuse.

Recent Advances in Orthodontics

- 1) Malocclusion and Dentofacial deformity in contemporary society – Epidemiology of malocclusion :
 - Classification of malocclusion.
 - Need for Orthodontic treatment.
 - Demand for Orthodontic treatment.
 - Why is malocclusion so prevalent?

- 2) The Etiology of Orthodontic problems :
 - Specific causes of malocclusion :-
 - Disturbances in embryologic development.
 - Skeletal growth disturbances.
 - Muscles dysfunction.
 - Acromegaly and hemimandibular hypertrophy.
 - Disturbances of dental development.

 - Genetic influences.
 - Environmental theory and development of the dental occlusion :-
 - Functional influences on dentofacial development.

 - Etiology in contemporary perspective :-
 - Changing views of etiology possibilities.
 - Etiology of crowding and malalignment.
 - Etiology of skeletal problems.

- 3) Orthodontic Diagnosis : The development of a problem list – The problem – Oriented Approach :
 - Questionnaire / Interview – (i) Chief complaint, (ii) Medical and Dental History, (iii) Physical Growth Evaluation, (iv) Social and Behavioural Evaluation.
 - Clinical Evaluation – (i) Evaluation of Oral Health, (ii) Evaluation of jaw and occlusal function, (iii) Evaluation of facial proportions, (iv) Which diagnostic records are needed?
 - Analysis of Diagnostic Records – (i) Cast analysis – symmetry and space, (ii) Cephalometric analysis.
 - Orthodontic Classification – (i) Development of classification systems, (ii) Classification by the characteristics of malocclusion.
 - Development of a problem list.

- 4) Orthodontic Treatment Planning :
- Timing of treatment.
 - Treatment planning of preschool children (primary dentition) – Alignment problems.
 - Incisor protrusion – retries.
 - Cross bit.
 - Anteroposterior discrepancies.
 - Vertical problems – (i) Treatment Planning for preadolescents (early mixed dentition), (ii) Treatment Planning for adolescents (late mixed and early permanent dentition), (iii) Treatment Planning for Orthodontic problems in adults.
- 5) Orthodontic Treatment Planning :
- Limitations, controversies and special problems.
 - Extraction in the treatment of malocclusion.
 - Growth modifications in the treatment of skeletal problems.
 - Skeletal problems in older patients, camouflage Vs surgery.
 - Treatment Planning in special circumstances.
 - Patients with systemic diseases.
 - Anomalies and injuries.
 - Cleft lip and palate patient.
- 6) Physiology of the stomatognathic system – Myology :
- The buccinators mechanism.
 - Functional movements.
 - Temporomandibular joint – its disorders and management, Functions of the stomatognathic system.
 - Mastication.
 - Deglutition.
 - Respiration.
 - Speech.
- 7) Preventive Orthodontics :
- Maintenance of a normal occlusion.
 - Space maintenance.
 - Abnormal resorption.
- 8) Interceptive Orthodontics :
- Development schedule and guidance of occlusion.
 - Equilibration of occlusal disharmony.
 - Habits and its management.
 - Muscle exercise.

- Serial extraction.
- Surgical uncovering of impactions, positioning and transpositioning.

CORRECTIVE ORTHODONTICS –

- 1) Removable and functional appliance – Active plate :
 - Parts of the appliance.
 - Classification of removable appliances.
 - Clasps.
 - Active elements – (i) Labial bows, (ii) Springs, (iii) Screws, (iv) Elastics.
 - Fabrication of plates.

- 2) Functional appliances – Concepts of functional jaw orthopaedics.
 - Definitions, History.
 - Scientific concepts and validation of functional appliances – (i) Research methodology and findings in Applied Craniofacial growth studies, (ii) Studies of functional appliance therapy.
 - Principles of functional appliances.
 - Cephalometric diagnosis for functional appliance therapy.
 - A detailed knowledge of mechanism of action, principles, indications, advantages, disadvantages, modifications, fabrication, management, parts, construction bite, effects and studies on following appliances – (i) Activator and its modifications, (ii) Bionator, (iii) Frankel, (iv) Twin block, (v) Magnetic functional system, (vi) Combined extra oral and functional appliances, (vii) Fixed functional appliances, (viii) Maxillary retraction and intrusion splints, (ix) Combined fixed and removable appliances.
 - Management of Class – II, Class – III and open bite malocclusions with functional appliances.

- 3) Headgears – Principles :
 - Biomechanics of headgear.
 - Orthopaedic forces.
 - Types.
 - Role of headgear in skeletal and dental correction.
 - Studies on headgear effects.

FIXED APPLIANCES –

- 1) Tip edge – Principles :
 - Bracket system and newer modifications.
 - Stages of treatment.

- NiTi torque bar.
 - Finishing.
 - Advantages.
 - Recent advances.
 - Straight edge.
- 2) Pre Adjusted Edgewise – Principles :
- Bracket system.
 - Wire sequencing.
 - Different modes of retraction.
 - Variations in different extractions patterns, clinical management, anchorage, recent advances in the following techniques – (i) Andrews, (ii) Roth, (iii) VSD, (iv) MBT, (v) Bio-progressive therapy, (vi) Combination techniques, (vii) Other PAE systems.
- 3) Begg Mechnaotherapy – Evolution :
- Principle.
 - Stages of treatment – (i) Stage – I Principles, (ii) Stage – II Principles, (iii) Stage – III Principles.
 - Bracket – (i) Types, (ii) Modification.
 - Springs – (i) Uprighting, (ii) Rotation, (iii) Torquing.
 - Wires – (i) Types, (ii) Dimensions, (iii) Uses.
 - Modern Begg – (i) Stages, (ii) Wires, (iii) Auxiliaries – a) Springs, b) Lock pins, c) Wires.
 - Mechanical aspects of anchorage control – (i) Frictional effects, (ii) Changes in auxiliary morphology.

COMBINED SURGICAL AND ORTHODONTIC TREATMENT –

- 1) Indications for surgery – Development of orthognathic surgery :
- Severity as an indication for orthognathic surgery: the envelope of discrepancy.
 - Esthetic and psychosocial considerations.
 - Psychological reactions to orthognathic surgery.
- 2) Surgical procedure and treatment possibilities – Correction of anteroposterior relationships.
- Correction of vertical relationships.
 - Correction of transverse relationships.
 - Genioplasty in orthognathic treatment.
 - Integration of orthognathic and other facial surgery.
- 3) Timing and sequencing of surgical treatment – Early Vs Later Surgery.
- Treatment sequencing.

- 4) Integration of surgical and orthodontic treatment – Interactive treatment planning :
 - Pre-surgical orthodontics.
- 5) Patient management at surgery – Surgical management :
 - Post-surgical orthodontics.
- 6) Post-surgical stability and clinical success.

ADULT ORTHODONTICS –

- Adult Orthodontics Treatment Objective.
- Ideal Orthodontic treatment goal and the Adult patient.
- Diagnostic considerations in Adult patients.
- Periodontal Diagnosis.
- Diagnosis of Temporomandibular Joint Dysfunctions.
- Adult Orthodontic Treatment Planning.
- Adult Patient Management.
- Concept of treatment sequencing.
- Management of Dentofacial Deformities.
- Retention and Stability after active comprehensive therapy.

TISSUE REACTIONS -

- Tooth supporting tissues – Gingival, Periodontal ligament, Root cementum, Alveolar bone, Bone physiology and metabolism.
- Physiologic tooth movement – eruption of teeth, occlusal equilibrium.
- Orthodontic tooth movement – tissue response in periodontium, transmission of mechanical influence into cellular reaction, biomechanical factors and tissue reaction in periodontium.
- Orthodontic forces : Types of forces – interrupted force, intermittent force, magnitude of forces, and duration of force.
- Types of tooth movements : tipping, torque, bodily movement, rotation, intrusion, extrusion.
- Theories of tooth movement.
- Tissues reaction to certain types of tooth movements.
- Tissue response in sutures – structure of suture, suture responsible to orthopaedic forces.
- Tissue response in the temporomandibular joint region – structure of T.M.J, T.M.J. response to orthopaedic forces.
- Drug effects on response to orthodontic force.
- Iatrogenic response of supporting tissues in orthodontics – Damages to periodontal tissues – Gingival inflammation, Alveolar bone loss, Marginal bone recession, Damage to tooth enamel surfaces, pulpal reaction, Root

resorption – root resorption not related to orthodontic, Root resorption caused by orthodontics – (Superficial resorption, Apical resorption), Factors affecting root resorption – (Tooth vulnerability, orthodontic appliances, magnitude of force, duration of force, direction of tooth movement), Risk of temporomandibular dysfunction.

- Post treatment stability.
- Recent Advances.

BIOMECHANICS –

- Introduction.
- Principles of engineering and biophysics.
- Sign conventions.
- Biomechanics of tooth movement – centers of rotation, Force magnitude and rate of tooth movement, Relationship of force magnitude to pain and tooth mobility, optimal force and stress.
- The orthodontic appliances – Active and reactive members, moment to force ration, load deflection rate, maximal elastic moment, manner of loading.
- Clinical correlations: Biomechanics of space closure, overbite control, transverse control.
- Anchorage and its control: Definition, Anchorage types, Principles, Situations, Significance of anchor loss, Adjuncts used in anchorage conservation, management of anchorage in transverse, Vertical and sagittal planes of space.
- Recent Advances.

ORTHODONTIC MATERIALS –

- Structure and properties of orthodontic material – (i) Metallic, (ii) Ceramic, (iii) Polymeric.
- Mechanics and mechanical testing of orthodontic materials.
- Orthodontic wires – (i) General terminology – a) Resiliency, b) Stiffness, c) Stress, d) Strain, e) Proportional limit, f) Deflection, g) Contact point, h) Range of action.
- Desirable properties of wires.
- Manufacturing.
- Wire alloys – gold alloys, stainless steel wires, cobalt chromium nickel wires, nickel titanium wires, alpha and beta titanium wire.
- Clinical selection of orthodontic wires.
- Comparison of contemporary arch wires.
- Effect of diameter and cross section.
- Effect of length and attachments.

BONDING –

- Types and principles.
- Enamel etching and bond strength.
- Orthodontic adhesive resins and composites – (i) Adhesives – a) Composition, b) Modifications – 1) Generation, 2) Self-etching primer, 3) Light cure primer – Hydrophobic, Hydrophilic, 4) MISP.
- Composite – (i) Composition, (ii) Self curing – Types, (iii) Light curing – Types.
- Principles of adhesion bonding to non conventional surfaces.
- Recent advances in bonding materials.
- Cements in orthodontics.
- Impression materials.
- Elastic materials and the production of orthodontic force – (i) The Basic properties, (ii) Rubber and plastic source of elastic forces, (iii) Elastomeric ligatures and chain – (a) Properties, (b) Types, (c) Use, (d) Force degradation.
- Causes of failure.
- Orthodontic bracket – (i) Metallic brackets, (ii) Aesthetic brackets, (iii) Lingual brackets.
- Debonding – (i) Techniques, (ii) Enamel damage, (iii) Magnets as a source of orthodontic force – a) Properties and composition, b) Types, c) Uses, d) Advantages and disadvantages, e) Modifications.
- Soldering and welding.
- Principles of biocompatibility.
- Allergic reactions and safety concerns.
- Recent advances in orthodontic materials.

RETENTION AND RELAPSE –

- Definition.
- History of Retention.
- Importance of Retention.
- Basic theorems.
- Periodontal and gingival reorganization.
- Occlusal stability.
- Tooth size discrepancy.
- Axial inclinations.
- Transverse discrepancies.
- Relationship of third molars.
- Growth factors.
- Further implications of growth.
- Duration of Retention.
- Retention appliances.
- Relapse – Definition.
- Causes of Relapse.

- Recovery after Relapse.

MISCELLANEOUS –

- Practice Management.
- Orthodontic Office Design.
- Community Orthodontic Care.
- Iatrogenic Effects of Orthodontic Treatment.

Paper I - Applied Basic Sciences.

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