**\*Orthodontics \*space analysis \*Lec. #19**
 - **objectives**:
 🡪 space analysis; helps us in decision making regarding extraction
 🡪 anchorage; do we need to use headgear or not…

 - **Special investigations in orthodontics**:
 1. Cephalometry
 2. Space analysis of study models; aims to decide if we need to extract or not

 - **Crowding**:
 🡪it’s a **negative** difference between the space **available** in the dental arch and
 space **required** for teeth alignment.

 🡪 divided according to many classification:
 1. **Degree of crowding**: - mild 🡪 <4 mm
 - moderate 🡪 4-8 mm
 - severe 🡪 >8 mm
 2. **Etiology** **of crowding**:
 - **primary**:
 \* inherited “genetically determined”
 \* either the jaw is small or the teeth are large “tooth size-jaw size discrepancy
 \* features through which we can predict if it’s genetically related:
 🡪 splaying out of upper incisors

 🡪 lingually locked upper lateral

 🡪 No spacing in **primary** dentition
 🡪 early loss of “a” and “c”
 🡪 undermining resorption of “E” by “6”
 - **secondary**:
 \* **acquired** throughout local factors
 \* represented by: early loss of primary teeth
 \* example:
 🡪 early loss of “e” 🡪 mesial tipping of “6”🡪 no enough space for “5”

 - **tertiary**:
 \* also known as: **late incisor crowding**
 \* multifactorial (late? growth of the mandible, Soft tissues “lips”,…)
 \* starts after an age of 12-13 year
 \* nearly “7” factors ,,, dr. didn’t mention

 





🡪 **Space analysis**:
 - **Principle**: bacically, we want to compare the space available for alignment, and the
 space required to align each individual tooth
 - it can be done: 1. directly on the cast using “Divider”
 2. On “3D” models using CAD/CAM technique
 🡪 scanning of cast or impression = digital cast
 🡪 space analysis is done on that digital cast by it self
 🡪 it is becoming more and more accurate, but that doesn’t
 mean that it’s more accurate than the direct way.

🡪 **How to calculate the space “available” in the arch**:
 \* Space from mesial side of “6” on one side to the mesial side of “6” on the other:
 1. Wire is passed from the contact point “6” on one side along with those
 “contacts” of posteriors and incisal edges of anteriors terminating in “6”
 on the other side, then we measure the wire
 2. Four segments way; we bring the **divider** and measure from:
 🡪 mesial of “6” to the mid of canine (segment “1”)
 🡪 mid of canine to the midline (segment “2”)
 🡪 midline to the mid of canine on the other side (segment “3”)
 🡪 mid of canine to the mesial side of the other “6” (segment “4”)
 \*\* the second way is more accurate.

🡪 **How to calculate the space “required”**:
 - we need to measure the MD width of each “erupted” tooth from contact tocaontact
 point using the divider or more accurately using the digital caliber “0.1 mm”,, then
 we sum the values together resulting the value of required space.

🡪 **The problem with space analysis**:
 1- it doesn’t give us any idea regarding the “protrusion”:
 🡪 meaning that it’s not necessary to see the crowding grossly in the arch, there
 could be an indication of that crowding through adaptation of teeth to that
 condition
 🡪 **example**: the presence of crowding isn’t indicated only through overlapping of the
 contact points, we could see an arch with nicely aligned anteriors, but at
 the same time they are “proclined” as an adaptation to the crowding
 condition 🡪 increase overjet.
 so it must be taken into consideration

 2- it doesn’t give as any idea about the growth:
 🡪 this method gives us the space required for this moment only, it can’t predict the
 space later on
 🡪 **example**: till the age of “12 years”, the arch continues to grow and expand, as a
 result of this we will have spaces that couldn’t be predicted previous to
 that age.

 3- Difficulty in calculating the required space in Mixed dentition:
 🡪 due to multiple un-erupted teeth in that stage, there is some kind of difficulty in
 calculating the MD width of those un-erupted teeth
 🡪**solution**: “step by step”
 - there is no problem in measuring the space in mixed dentition from “6” to “6”, so
 we can find out the space “**available**”
 - the space “**required**” is measured **indirectly** through sth. Known as “mixed
 dentition analysis”

 🡪 **mixed dentition analysis**: method through which assessment/analysis the space
 for the permanent teeth when the patient is in the
 mixed dentition, involving estimation the size of
 erupted permanent teeth (ex: “3”,,”4”,,”5”,.)

**\*Methods of mixed dentition analysis**:
 1. ***Radiograph***:
 - in a radiograph, “5” is un-erupted and overlied by “E”, and we want to estimate
 the width of “5” from this radiograph: “steps”
 🡪 construct a study model: we will get “E”, then we can measure
 the width of “E”.
 🡪 Take a periapical radiograph “parallel technique more accurate”: from
 this radiograph, we can measure the width of both “E” and “5” under it
 🡪 use this formula: **“compensation method in order to know the magnification”**
 width of “E” on radiograph width of “5” on radiograph
 width of “E” on the cast width of “5” on cast (x)
 🡪 for every individual tooth, we take a periapical radiograph
 🡪 ***the problem with this method:***
 1. Usually, we have distortion in the radiograph specially in the canine area
 2. Too much exposure to radiation “each individual tooth must be radiographed”

 2. ***Proportionality tables without using radiographs:***
 - Tanaka & Johnston measure the **total** width of lower incisors from the cast, and
 from this value, they could predict the width of “3”,”4”,and “5” in **one
 quadrant**.
 - original equation “don’t emorize”:
 
\*\* Dr. will give us a reference including Jordanian equation!
 - why we don’t use the width of upper:
 🡪 cuz there are a lot of variations specially in upper laterals “peg-shaped,
 missing,..”
 🡪 advantages: no radiographs
 🡪 disadvantages: small tendancy for over-estimation of the width compared to it’s
 actual value, but it’s practical and used (Y)

 3. ***Combination of both “most accurate method”***:
 - no need to take it in details
 - combination between both methods, but it’s **only** related to **lower arch**
 - population specific

\*\* **as I understood from the record, that all these methods are population specific
 except method #1**-----------------------------------------------------------------------

 \* **Space planning**:
 - After we determine the amount of space that is **required**, we want to calculate the
 amount of space that we’ll create during treatment.

 - you have to put in your mind that there are many orthodontic procedures that need
 space, ***not only the crowding***:
 1. **Crowding** :
 🡪mild: <4 mm
 🡪moderate: 4-8 mm
 🡪 severe: >8 mm
 2. **Decrease overjet**
 🡪 related to antero-posterior position of the tooth in the arch
 🡪 **every reduction in 1mm needs 2mm space in the arch**:
 - if the overjet = 3, and want it to be “2”, then we need 2 mm space
 - if the overjet = 4, and want it to be “2”, then we need 4 mm space
 - formula: **(current overjet – required overjet ) X 2 "الأولوية للأقواس"**

 3. **Arch contraction**
 4. **Tooth angulation “mesio-distal tipping”:**
 - if the tooth is angulated, then it occupies more space than when it’s upright
 - also if the tooth is severely upright, then we need to angulate it in order to get
 a space
 5. **Tooth inclination “bucco-lingual tipping”**
 6. **Leveling of curve of spee:** - the normal curving of this curve is almost straight, so when we face a case
 more curving of curve of spee, this means that the patient has deep over bite
 - if we want to level this curve, the incisors will procline, then we need a space
 - if we don’t want to procline the incisors, but at the same time we want
 to level this curve, we have to create a space:
 🡪 If the deepest part of curve of spee ≤ 3mm then we need 1 mm space for
 **all arch** 🡪 If the deepest part of curve of spee = 4 mm, then we need 1.5 mm space
 **for all arch** 🡪 if the deepest part of curve of spee ≥ 5mm, thwen we need 2 mm space
 **for all arch** - **according to that, the maximum space required for leveling the curve of
 spee is : “2mm” for all arch** 7. **Torque**: position of the crown in relation to the root:
 - correct the inclination of retroclined upper incisors so as to provide a space

 - **How to correct retroclination**:
 🡪 bringing the root palatally, and this involves movement of contact points
 distally
 🡪 the idea: bringing the roots palatally “retroclination” does need space
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\*\* **What about expansion**:
 - by arch expansion, we provide a space
 - by arch contraction, we need a space
 - according to many experiments, every “1 mm” expansion of the whole arch, a space
 of “0.5 mm” is provided in the whole arch, and vice versa “regarding contraction”
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🡪 because of that before any orthodontic procedure, we must do what’s called
 (comprehensive space analysis), in order to collect all our information and confirm
 the treatment plan

Thank you
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