***Unerupted maxillary canine***

***Definition***

Canine that is prevented from eruption into its normal functional position by bone, tooth or fibrous tissue.

-according to Richardson there are two types of impaction: bony or dental.

Note: there are a lot of references in this lecture and they are references that you need to know and the doctor chose more than one research for us and he will ask about them in the exam.

***Time of eruption***

-Maxillary canine: 11-12 year old and should be palpable around 10.

-Mandibular canine: 9-10 year old.

-We also should know the standard deviation of the eruption time which is around three years.

***Prevalence***

-In European population it’s about 1-2%. (According to Ericson and Kurol, very important names as they did a lot of effort regarding impacted canines).

-in Jordan in 2001it was 4.7 %.( study done by dr Hamdan).

-The developmental absence is 0.08% so it’s very unlikely that the patient come with unseen canine clinically with the problem being developmentally missing canine, it’s probably impacted.

-F: M is 2: 1

***Causes***

1. Long path of eruption (Richardson).

Canine develops very high near the orbit and has to travel around 22 mm to reach the occlusal surface (backward>>forward>>downward) so a lot of things could go wrong during this journey preventing the canine from reaching its final destination.

1. Displacement of the crypt.
2. Problems with the maxillary lateral incisors ( missing, peg shaped, short root …)

If you have problem with the lateral incisor then you have 2. 4 times more chance of having impacted canine (Becker study).

1. Crowding
2. Retention of primary canine.
3. Mesio- dilaceration of upper 4(less common).
4. Trauma to the anterior region of maxilla

Causes ankylosis to the primary teeth resulting in impacted canine.

1. Pathology,odontome,supernumerary…
2. Generalized abnormal delayed in eruption
3. None of the previous factors then it’s unknown.

***Theories of impaction***

We have two main theories;

1. The guidance theory( by Becker)

The canine is guided to its place by the distal surface of the lateral incisor so if there’s any problem in the lateral incisor the canine can’t find its way.

* There’s study made by dr. kathem alnemri and he actually find that 12.6% of patients with missing lateral incisor has an impacted canine and he found that if you have any problem with the lateral incisor then there is 6 times more risk for having impacted canine. (remember Becker study was 2. 4%) and here the percentage is higher probably because the sample wasn’t random.

1. The genetic theory (by peck)

It means that its controlled by our genes and that you are predetermined that you will have impacted canine.

***Why are we so concerned about impacted canine ??***

The main reason is that impacted canine is associated with root resorption of the lateral incisor and if that happens that means we have lost two teeth in the arch (assuming that the canine is still impacted and we couldn’t bring it into its position).

-initially Ericson and kurol found that about 12% of impacted canine causing root resorption of the lateral incisor and this study was based on panoramic radiograph but after the developing of CBCT scan they looked into similar sample and they found that its actually 48% .

-The doctor showed a picture of patient with canine erupted at one side and missing on the other so we took panoramic radiograph which did not show any root resorption of the lateral incisor then we took CBCT scan that showed that one third of the lateral incisor is actually resorbed and the apex of the central incisor is gone too. So you can’t rely on OPG or periapical radiograph alone.

***Risk factors***

1. Females.
2. Less than14 year old.
3. A lot of root development of the canine.
4. Canine crown is mesial to the midline of the lateral incisor.
5. If it’s horizontal or palatal.

***As a general dentist what could you do ??***

* You have a big responsibility and you actually can do some management that could prevent the impaction of the canine or extraction of the lateral due to root resorption.
* So if patient comes to you and you suspect a problem you can do the following:

1. Inspect (the bulge of the canine, inclination and color of adjacent teeth).
2. The most important thing you can do is palpate the labial sulcus and look for mobility of C and 2.
3. Then you can go for radiographic examination.

* Note: when you look at vertical parallax radiographs you need to have a horizontal reference point, if the canine moves up to this point then it’s palatal and if it moves down then its buccal.
* A very important paper: it’s a longitudinal study and analysis of clinical supervision of maxillary canine eruption and it’s basically predict whether the canine will be impacted or not from palpation. so they look at 505 children at age 8-12 year and they found that

At age 8 >> 73% of the canine weren’t palpable.

At age 10>> 29% weren’t palpable.

At age 11>> 5% weren’t palpable.

After age 11 only 3% weren’t palpable.

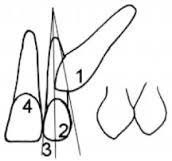
So at age 10/11 most of the canines (that will erupt normally) will be palpable. And from the 384 canine that were palpable 383 erupted normally so it’s very good way for detecting any problem.

***When do you need to follow radiographically??***

1. If there is asymmetry on palpation or difference in the timing of eruption between right and left canine.
2. If the canine can’t be palpated and the development of other teeth is normal.
3. Abnormal color or inclination of adjacent teeth as if the laterals are buccaly displaced or proclined (when the canine is front of the root of the lateral it will push the crown buccaly).

***Once we took the radiograph what should we do? How can we predict whether this canine is going to be impacted or not??***

Another paper by lindauer, he looked retrospectively into two groups of chronologically and dentally aged matched patients. 28 patients with unilateral or bilateral impacted canine and 28 patients with normally erupted canine and all have panoramic radiograph.

And he came up with the *sector method.*

Sector one: anywhere distal to the lateral incisor.

Sector two: from the distal surface of the lateral to the

midline of the lateral.

Sector three: from the midline of the lateral to the mesial

surface of the lateral.

Sector four: anywhere mesial to the lateral incisor.

Results:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sector number | Sector one | Sector two | Sector three | Sector four |
| Non impacted  canine | 6 | 3 | 0 | 0 |
| Impacted canine | 9 | 15 | 10 | 7 |

* If the canine in sector2, 3, 4 it has 91% chance of being impacted.
* 32 of the 41 impacted canines (78%) can be predicted by being overlapping the lateral incisor (we have some impacted canines that are related to sector one which isn’t overlapping the lateral).
* 91% of the normally erupted canines can be identified by them not overlapping the lateral (we have some normally erupted canines that are related to sector 2 which is overlapping the lateral).

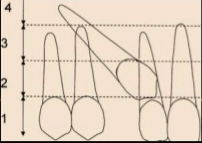
***Prognosis***

Prediction of the outcome of treatment.

There are four factors that you need to look at:

1. *Vertical relationship*

Put an imaginary horizontal line between the apex of the

lateral incisor and the apex of 4.

-If the canine is above this line then the prognosis is poor.

-If the canine is one third down the root (apical third) then

the prognosis is fair.

-If the canine is another third down the root the prognosis is good.

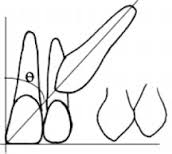
And this is also related to the treatment time; the further the canine is from the occlusal plane the longer the treatment duration.

<14mm from the occlusal plane >> 24 months.

>14mm from the occlusal plane >>31 months.

1. *Horizontal relationship*

We look at two lines: the midline of the lateral incisor and the mesial of four (if it’s between two lines the prognosis is good).

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1. *Angulation to the midline of the OPG*

When the canine is more horizontal (the angle increases)

the prognosis is worse.

1. *Stage of root development*

The more the root is developed the worse the prognosis because as the root is forming there is still some erupting power left.

The factor with the most difficulty index is the horizontal one. (Very important factor)

***Treatment options***

1. Do nothing; leave it and observe.
2. Interceptive treatment.
3. Expose the canine and bring it down orthodontically.
4. Remove the canine.
5. Surgical removal and autotransplantation.

*a) Leave and observe when??*

The canine isn’t causing any functional or esthetic problem, no pathology, the contact between 2 and 4 is good or the C looks like it’s in a good position, poor prognosis and we can’t correct it (even surgically it could be near the orbit or the sinus so we could do more damage to the patient by removing it) so we just follow it up and ask for radiographs every 6-12 months but if its starting making problem we definitely remove it.

b) *Interceptive treatment*

-Extraction of C; very easy thing that you can do at your clinic.

-Ericson and kurol” again” did a research regarding the interceptive treatment and they found that if the canine was in sector 2 or greater, 78% of the canines will be normalized within a year in patients without any crowding.

-in patients with crowding they found that the percentage was 62%.

- If 3 is overlapping the 2 (reaching sectors three and four) the chances of normalization are reduced.in their study they found that if it up to sector two 91% corrected but if it passes sector two only 64% corrected.

-The doctor showed some cases regarding the interceptive treatment and in some cases we can find that the canine returns perfectly to its position and in other cases we could notice that the canine is improving (from 4 to 3, 2 for example).

c) *Treat orthodontically*

-When the canine has good prognosis and the factors are favorable (good dental health, motivated, good oral hygiene and cooperative as the treatment may take a long time).

-you need to provide space if there is space requirements ( you either distalize the buccal segment in case of half unit class two molar relationship or extraction if you couldn’t make distalization).

-Two ways to expose the canine surgically and it depend on the position of the canine:

a) If the canine is palataly impacted then we do *open surgical exposure* because we have attached gingiva in the palate.

b) In the buccaly ectopic canine we are worried about attached gingiva so we do *close surgical exposure* (otherwise we will have recession and the esthetic and periodontal health will be compromised).if it wasn’t too high up we can go for apically repositioned flap and if its high we do close surgical technique (open and put gold chain on the crown then close again) then we apply force to this chain and one of the best methods of applying force to extrude the canine is *removable appliance* because in extrusion we need vertical anchorage and in removable appliance we take the anchorage from the palate as the removable appliance works as one unit( palate and teeth together), while in fixed appliance every tooth works alone so we have to connect teeth together using thick wires.

Another research that related treatment time to the sectors:

Sector1, 2 >> 17 months.

Sector 3>> 20 months.

Sector 4>> 27 months.

*d) Extraction*

-poor prognosis.

-good 2/4 contact.

-poor patient cooperation.

-causing pathology

-it’s not really in far difficult position.

* The doctor then showed a case of one of his patients with impacted canines (they were in sector 4, vertically is good, angulation isn’t good). So the doctor was thinking of taking the canines out but the patient refuse, the doctor then took CT scan. the patient has crowding in the upper arch but the doctor didn’t extract the 4 because he was afraid that he couldn’t bring the canine to its normal position so he started with traction first then the doctor explained how painful was the treatment to the patient and that it took a long time without noticeable improvement so at the end the doctor decided to extract the canine!!.

e) *Surgical removal and autotransplantation*

-Ideally if you want to do this you should have 50-75% of root formation (if it’s fully formed the root will be ankylosed).

- The patient has missing 2 and 3 in poor position or something blocking its way preventing it from eruption so the patient will end up with 2 missing teeth.

-you take the canine out and do endo treatment then open a hole in the labial sulcus and return the canine above the periosteum.