Serial Extraction

Introduction

Generally, the orthodontic treatment procedures can be divided into: Preventive, Interceptive, and Comprehensive procedures.

*Preventive orthodontics* is that part of orthodontic practice, which undertake the diagnostic procedures to predict the appearance of malocclusion and the treatment procedures instituted to prevent the onset of malocclusion. Preventive procedures can include Parent education, Caries control, Care of deciduous dentition, Management of ankylosed tooth, Maintenance of tooth shedding timetable.

*Interceptive orthodontic* is that part of orthodontics employed to recognize & eliminate potential irregularities & malpositions of the developing dento-facial complexes. Procedures undertaken in interceptive orthodontics can include Serial extraction, Correction of developing crossbite, Control of abnormal habits, Space regaining.

Preventive procedures are undertaken in anticipation of development of a problem, whereas interceptive procedures are undertaken at a time when the malocclusion has already developed or is developing.

*Comprehensive orthodontic* implies an effort to make the patient's occlusion as ideal as possible, repositioning all or nearly all the permanent teeth in the process, solving almost all malocclusions. It usually requires a complete fixed appliance and its ideal time is during adolescence in early permanent sage.

Serial extraction is an interceptive orthodontic procedure usually initiated in the early mixed dentition. It is *defined as a timely planned extraction of certain deciduous and, ultimately permanent teeth to relief severe crowding, and guide the erupting permanent teeth into a more favorable position, during the transition from the primary to the permanent dentition.*

**Rationale of Serial Extraction:**

Serial extraction is based on two principles:

1. **Tooth size - Arch length discrepancy**

Whenever there is an excess of tooth material as compared to the arch length, it is advisable to reduce the tooth material in order to achieve stable results. This principle is utilized in serial extraction procedure where tooth material is reduced by selective extraction of the teeth so that the rest of the teeth can be guided to normal occlusion.

2. **Physiologic tooth movement**

Human dentition shows a physiologic tendency to move towards an extraction space. Thus by selective removal of some teeth the rest of the teeth which are in the eruption are guided by the natural forces into the extraction spaces.
Criteria of Serial Extraction Patient

(Indications)

- The fundamental arch relationship should be normal (Class I skeletal pattern), the essential elements of the stomatognathic system are in balance, so it is typically indicated in Class I malocclusions.

- Severe arch length deficiency as compared to tooth material is the most important indication for serial extraction. There should be a large arch perimeter deficiency of 10mm or more (i.e. 5mm or more per quadrant). This can be found as a rotation, displacement or overlapping of incisors.

- The patient should be in early mixed dentition, i.e. Between 8 to 9 years of age and the incisor crowded.

- There should be normal or reduce overbite and all the teeth should be present on radiograph and in good position to erupt.

Contraindications

1. Class II and Class III malocclusion with skeletal abnormalities. It is unwise to start serial extraction in a child who has a skeletal problem, because the closure of extraction spaces would be affected by how the skeletal problem was being treated.

2. If the initial discrepancy is smaller, tooth size arch length deficiency < 5 mm per quadrant. If the initial arch length discrepancy is small, more residual space at the end of treatment must be anticipated.


4. Unerupted malformed teeth e.g. dilacerations.


6. Extensive caries or heavily filled first permanent molars, which cannot be conserved.

7. Open bite and deep bite, which should be corrected first.

Diagnosis and Treatment Planning

At dental age (7-8years), the maxillary and mandibular central incisors are usually erupted, but there is inadequate space in anterior segments to allow normal eruption and positioning of lateral incisors. In some cases, lateral incisors have already erupted but they are usually lingually positioned and rotated.

In such cases, complete diagnostic records including intraoral radiographs, cephalometric radiographs, facial photographs, study models, should be made and studied. Arch-length analysis must be considered in determining whether there is severe arch length tooth size discrepancy. Whenever there is Class I malocclusion with severely crowded incisors, reduction of tooth mass can results in an improvement in the alignment of the incisors.

During diagnosis, there are some important information, regarding the development of the dentition, should be taken in consideration. For instance, the permanent teeth start the pre-mergence eruption when the root begins to develop and they emerge into the oral cavity when three quarters of their roots are formed. Usually if primary tooth is extracted and its permanent successor had less than half root formation. This would delay the eruption of the permanent; whereas, if successor had more than half root formation the eruption would be accelerated.

Dental age determination is necessary here; it is based on observation of age at eruption of the primary and permanent teeth and the rating of tooth development from crown calcification to
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root completion using x-rays of the unerupted and developing teeth. Length of the roots of the 1st premolars and canines and the relative crowns position to each other, using a radiograph is important to determine the appropriate timing and sequence of teeth extraction. On balance, no single extraction sequence applies to all patients, and extraction sequence is not necessary the same for both arches (maxilla & mandible) of the same patient.

Sequence of extraction:

The classic procedure of serial extraction has been the elimination of the primary canines, primary first molars, and permanent first premolars. This has been the most popular and widely used procedure. Results will be more rewarding if the orthodontist does not cling to a particular sequence but varies it according to the diagnosis.

Examination of radiograph often reveals a crescent pattern of resorption on the mesial side of primary canine roots. This is an indication of a true hereditary tooth-size/jaw-size discrepancy. The radiograph also signifies that the 1st premolar emerging favorably, ahead of permanent canines and none of the unerupted permanent teeth has reached half of the root length. The extraction sequence will be as following:

Step 1: Extraction of the Primary Canines
This will produce a rapid self-improvement and alignment of crowded incisors, and intercept the development of lingual crossbite of the lateral incisors.

Step 2: Extraction of the Primary 1st Molars
The incisor crowding has improved, the overbite has increased, and the extraction site is reduced in size. If the radiograph reveals that the permanent 1st premolars have reached half of the root length, now it is the time to extract the primary 1st molars to encourage the eruption of 1st premolar teeth.

Step 3: Extraction of the First Premolars
10 months following extraction of deciduous 1st molars, the 1st premolar will have erupted. When the permanent canines have developed beyond half of the root length, indicating that they are at a stage of accelerated eruption rate, so the clinician extract the 1st premolars.
On the other hands, if the radiograph shows that, the crowns of both the first premolars and canines are approximately at the same level and the canines have considerable root length, i.e. they are erupting faster than the premolars. In this condition, the deciduous canines are maintained to slow down the eruption of permanent canines, and the extraction sequence is modified as following:

**Step 1: Extraction of the Primary 1st Molars.**
When half root length of the first premolars have developed, the primary 1st molars should be extracted to accelerate the eruption of the first premolars into the oral cavity ahead of the canines.

**Step 2: Extraction of the Primary Canines and 1st Premolars.** When the first premolars have emerged sufficiently they are extracted along with whatever primary canines remain. When the permanent canines erupt, they migrate posteriorly into good position. Any irregularities in mandibular incisors if not too severe, get corrected themselves and they are also tipped lingually due to normal muscular forces.

**Multibonded Fixed Treatment**
In almost all cases, conventional orthodontic therapy is required; it is complementary step to serial extraction procedure. Fixed appliance phase is usually needed to complete the alignment of teeth, to parallel the roots on either side, because at their eruption, the canines have a distoaxial angulation and 2nd premolars a mesioaxial angulation. Also, to eliminate a relatively deep overbite and complete the residual space closure at the extraction sites. However, such mechanotherapy is usually of significantly shorter duration, less likely to produce damage and the results are more stable.

**Advantages**
1. Naturally induced movement and alignment of seriously crowded anterior teeth.
2. Improved health of investing tissues.
3. Improved psychologic state and better patient compliance as a result of improve alignment.
4. Makes later comprehensive orthodontic treatment easier and quicker, it reduces the duration of multibonded fixed treatment.
5. Less potential iatrogenic damage.
6. Cost is minimal.
7. It is often within the range of general practitioners.

**Disadvantages**
1. The most common unfavorable sequela of serial extraction procedure is deepening of overbite, due to uprighting or lingual tilting of incisors.
2. Treatment time is prolonged as this is carried out in stages spread over 2-3 years.
3. It requires the patient to visit the dentist often, thus patient co-operation is needed.
4. Improper timing of extraction may lead to delay eruption of secondary teeth.
5. If the procedures are not carried out properly, there is a risk of arch length reducing by mesial migration of the buccal segment. Thus a poorly executed serial extraction program can be worse than none at all.