Serial Extraction In Orthodontics – Review Article

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Abstract

Serial extraction or guidance of eruption is the planned and sequential extraction of certain deciduous teeth followed by extraction of specific permanent teeth in the early mixed dentition period in order to encourage the spontaneous correction of tooth irregularities. It is an integral part of interceptive orthodontics aimed at reducing the severity of the developing malocclusion. Keywords: Serial extraction, mixed dentition, Interceptive orthodontics, developing malocclusion, preventive procedure

Introduction

Serial extraction is a sequential plan of premature removal of one or more deciduous teeth so as to enhance alignment of succedaneous permanent teeth with eventual removal of permanent teeth to take care of the right ratio between tooth size and available bone. Dental crowding exists when there is more tooth material in relation to the basal and alveolar bone that supports the teeth. This procedure is typically done at an early mixed dentition period. This text presents a review regarding the serial extraction, its limitations and various adjuncts that are required to get good results. (Fig 1)

Fig 1: Planned extraction of certain deciduous teeth & later specific permanent teeth in an orderly sequence.
History

- Robert Bunon (1743) was the one to primarily explain serial extraction.
- Kjellgren (1929) coined the term “serial extraction”.
- Nance (1940) is known as the “Father of serial extraction”.
- The other pioneers who advocated this procedure were Hotz, Tweed, Dewel and Jack Dale. [3]
- Hotz renamed the technique as “Guidance of eruption”.

Definitions

- PROFFIT – Timed extraction of primary and ultimately permanent teeth to relieve severe crowding.
- DEWEL – An orthodontic treatment procedure that involves the early removal of selected deciduous and permanent teeth in a predetermined sequence.
- TANDON – A timed, planned removal of certain deciduous and permanent teeth in mixed dentition cases with dento-alveolar disproportion. [4]

Principles [5]

Serial extraction is predicated on 2 basic principles:

1. Arch length tooth material discrepancy
2. Physiologic tooth movement

Indications

- Severe crowding with arch deficiency of 8-10mm or more.
- In class I malocclusion with no skeletal disproportions and showing harmony between skeletal and muscular system with normal overbite & good skeletal profile.
- Tooth size / jaw size discrepancy.
- Absence of physiologic spacing. (Fig 2a)

Fig 2a: Potential lack of space in the primary dentition indicates crowding of teeth when permanent teeth erupt.
• Lingual eruption of permanent lateral incisor. (Fig 2b)

Fig 2b: Permanent lateral incisors erupting lingual to the retained primary lateral incisors.

• Unilateral deciduous canine loss and shift to the same side. (Fig 2c)

Fig 2c: Unilateral loss of deciduous canine with incisor crowding leads to midline shift and loss of space for permanent canine.

• Mal positioned or impacted lateral incisors that erupt palatally out of the arch.
• Abnormal / asymmetric primary canine root resorption.
• Labial stripping or gingival recession usually of lower incisor. (Fig 2d)

Fig 2d: Extreme crowding / protrusion and loss of overlying bone on labial surface.

• Mesial eruption of canines over lateral incisors.
• Abnormal eruption, direction and eruption sequence.
• Ankylosis, etc….\textsuperscript{[6]}

**Contraindications**\textsuperscript{[6]}

1. Congenital absence of teeth providing space.
2. Mild to moderate crowding.
3. Deep or open bites.
4. Severe class II, III dental / skeletal origin.
5. Cleft lip and palate.
7. Anodontia / Oligodontia.
8. Midline diastema.

**Advantages**\textsuperscript{[7]}

• Psychological trauma can be avoided.
• Reduces the duration of the multi banded treatment.
• Physiological treatment because it involves the guidance of teeth into normal positions making use of physiological forces.
• Better oral hygiene.
• Reduces cost of treatment.
• More stable results.
• Lesser retention period is required.

**Disadvantages**\textsuperscript{[7, 8]}

• Long term procedure that requires thorough knowledge of growth, development, eruption sequence and calcification of permanent teeth.
• Prolonged treatment time with multiple visits (2 – 3 years).
• Patient cooperation is very important.
• Possibility of developing tongue thrust.
• Tendency to increase over bite (deepening of the bite).
• Residual spaces can remain between the canine and second premolar.
• Subjecting the child to multiple progressive extraction visits.

**Technique & stages**\textsuperscript{[9]}

1. **REVERSIBLE PHASE**
   • Done during first transitory period.
   • Extraction of anterior deciduous teeth.
   • Allow the alignment of the permanent incisors.

2. **IRREVERSIBLE PHASE**
   • Done during second transitory period.
   • Extraction of permanent teeth.
• Correcting the crowding of the posterior segment.

**DIAGNOSIS:**

1) **PROPORTIONAL FACIAL ANALYSIS**

According to Grabber (1971) the face is split into Standard or orthognathic face i.e. the relationship between maxilla and mandible, maxilla and maxillary dentition, mandible and mandibular dentition and maxillary dentition and mandibular dentition are normal. [10]

2) **ALVEODENTAL PROTRUSION**

Class I maxillary-mandibular alveodental protrusion:

- The facial pattern is normal with the dentition arc relatively forward. This facial pattern responds well to serial extraction. [11]

Class II maxillary alveodental protrusion:

- The maxillary dentition is forward and can be treated with serial extraction in maxilla only.

Class III: Not suitable for serial extraction.

3) **ALVEODENTAL RETRUSION**

Class I maxillary mandibular alveodental retraction:

- Patients should be treated without extractions.
- Extractions create a dished in face. [12]

Class II mandibular alveodental retraction:

- Serial extraction not indicated.

4) **PROGNATHISM**

Class I maxillary mandibular prognathism:

Indicated if,

- Teeth are severely crowded.
- Because of the increase in size of jaws, extraction usually not indicated. [13]

Class II maxillary prognathism:
Fault in the maxillary base itself
- Long anterior cranial base
- The cranial base being flat creates a downward and forward position of the nasomaxillary complex
- Difficult to treat with serial extraction

5) RETROGNATHISM

Class I maxillary-mandibular retrognathism

- As the maxilla and mandible are placed relatively backwards, extractions are contraindicated.

Class II mandibular retrognathism:

- Small corpus of mandible or small ramus or due to excess vertical developmental of nasomaxillary complex.
- In such cases, the mandible rotates backwards and creates an open bite.
- Not a good case for serial extraction. [14]

Diagnostic pre-requisites

1) EXAMINATION AND CONSULTATION

2) DIAGNOSTIC RECORDS

- Photographs
  
  Pre, mid and post-treatment intra and extra oral photographs are taken. They act as permanent records of pretreatment state, improvements during the procedure and also help in patient motivation.

- Radiographs
  1. Intraoral periapical view
  2. Lateral cephalogram
  3. Orthopantomograph (OPG) - Helps to detect congenitally missing teeth and supernumerary teeth, to carry out radiographic and mixed dentition analysis, to assess dental age and amount of root development and possible eruption pattern and to detect any bony pathologies. [15]

- Orthodontic study models
  
  Required for assessing the morphology of teeth and dental arch form and evaluation of occlusion as also to perform model analysis namely, Carey’s analysis in the lower arch and Arch perimeter analysis in the upper arch. [15]
Treatment plan and sequence of extraction

There are mainly three methods:

a) Dewel’s method (CD4) - 1954
b) Tweed’s method (D4C) - 1966
c) Nance method (D4C)

DEWEL’S METHOD:

- Extraction of deciduous canine (8.5 years)
- Extraction of first deciduous molar
- First premolar erupts
- First premolar extracted
- Permanent canine erupts (Fig 3a)

Fig 3a: Dewel’s method. This is a 3 step serial extraction procedure. Deciduous canines are extracted. Deciduous 1st molars are extracted a year later. Followed by extraction of erupting 1st premolars.

TWEED’S METHOD:

- All deciduous first molars are extracted (8 years)
- First premolar erupted
- After 1st premolar erupts, premolar along with deciduous canine is extracted.
- Permanent canine erupts (Fig 3b)
Fig 3b: Tweed’s method. Extraction of deciduous 1st molar around 8 years of age. Followed by extraction of 1st premolar & then the deciduous canines.

NANCE TECHNIQUE:

- All deciduous first molars are extracted (8 years)
- First premolar erupted
- First premolar extracted
- Deciduous canine extracted
- Permanent canine erupts (Fig 3c)

Fig 3c: Nance method involves the extraction of the deciduous first molars followed by the extraction of first premolars and then the deciduous canines

Complications

The complications of serial extraction are:

“ANTERIOR CROSSBITES” [16] (Fig 4)
Fig 4: Results in flat face with prominent chin. Patient may look aged, resulting in lingual inclination of incisors.

The anterior crossbites can present themselves as:

- Dento – alveolar ant. crossbites
- Skeletal ant. crossbites
- Functional ant. crossbites / pseudo class III malocclusion

Conclusion

Serial extraction is an interceptive orthodontic procedure undertaken in the early mixed dentition period that involves planned removal of certain primary and permanent teeth in a programmed sequence so as to relieve crowding in the arches and to guide the remaining erupting permanent teeth into a more favorable position.

References