Serial extraction is used for those patients that have 8mm or more of crowding, who have a Class I occlusion with a minimal overbite or an openbite and protrusive dentition relative to the face. Approximately 15% of the population have 8mm or more of crowding and are therefore suitable for serial extraction procedure. The serial extraction procedure classically involves the extractions of primary canines as the lateral incisors are erupting. This allows the crowded permanent central and lateral incisors to spontaneously improve their alignment. Then at approximately age 9 to 10, first primary molars are extracted. The purpose of this procedure is to accelerate the eruption of the first premolar teeth. When one considers that the normal eruption sequence in the upper arch involves the eruption of first premolars before the canines, the
extraction of upper primary first molars is often not needed. By contrast in the lower arch, 50% of the time the first premolars erupt before the canines and the other 50% of the time the lower canines erupt before the first premolars. Therefore, in the lower arch when the eruption sequence is unfavourable, then the extraction of lower first primary molars is suitable to facilitate or accelerate the eruption of the first premolars. The first premolars are then extracted upon eruption usually at age 11 to 12 and there is a period of what is commonly called driftodontics. Driftodontics is the natural movement of teeth into the extraction space, and often significantly improves alignment and makes future active orthodontic treatment easier and shorter. When all permanent teeth are fully erupted, the patient would have comprehensive treatment to detail the alignment, close residual extraction spaces and parallel the roots. Severely bimaxillary protrusive patients who require maximum retraction of incisors are not suitable candidates for serial extraction.
When serial extraction is performed, the lower incisors tend to improve their alignment significantly. In a longitudinal study by Yoshihara, there was a 6mm improvement in the irregularity index after lower primary canines were extracted. There is a continuing improvement in incisor alignment after the extraction of the first premolars but to a much lesser extent. The greatest incisor alignment comes from primary canine extraction.

One modification that needs to be considered for serial extraction is whether premolars should be enucleated rather than extracted upon eruption. Some children are particularly apprehensive about extractions and as a result, the extractions of primary canines followed by first primary molars, followed by premolars extractions becomes an adverse behavioural issue for children who are needle phobic. For such children, the enucleation of premolar teeth, that is extraction of the first primary molars and simultaneous extraction of the unerupted premolars, results in less intervention. When done under sedation or general anaesthesia,
the child often does not associate the extractions with a negative dental experience.

When one considers how the teeth move secondary to serial extraction, the major change is the improvement in alignment. There is tilting of teeth adjacent to the lower extraction sites but not adjacent to the upper extraction sites. Specifically, the lower canine tips back into the lower extraction site, requiring future uprighting. In addition to this, the Curve of Wilson in the lower arch becomes more accentuated. Not only do the lower molars tip forwards, but also would roll in towards the lingual. The Curve of Spee deepens after serial extraction and frequently the lower incisors tip back 5° after lower premolar extraction. There can also be a two-step occlusal plane with 6 anterior teeth (canine-to-canine) at one level and the posterior dentition at a separate different level. During active treatment, the levelling of the Curve of Spee usually returns the lower incisors to their pre-extraction position. Often during active orthodontic treatment, it is the lower arch treatment which takes the time both because of the levelling
and because of the need to upright tilted teeth adjacent to the lower extraction site.

A major advantage of the serial extraction procedure is that the crowded permanent canines are not displaced buccally from the line of the arch. In many late premolar extraction cases, the crowded canines are displaced to the buccal such that they erupt with minimal attached gingiva. This gingival retreat remains after the fixed appliance treatment. By contrast, the serial extraction cases have the canines erupt into attached gingiva which is a significant advantage.

Another advantage to serial extraction is a reduction in the Phase II treatment time. When studies that compare similar treatment outcomes for serial extraction and late premolar extraction are done, we find that the serial extraction cases have a treatment time reduction of anywhere from 4 to 12 months, depending on the study. Also, the serial extraction cases tend to have an easier PAR index compared to late premolar extraction cases, as a result of the driftodontics.
Some claim that the improved alignment of the incisors secondary to serial extraction results in improved stability. The study by Little shows that this is not the case. However, there may be a difference in stability between those serial extraction cases that show good alignment of incisors compared to those that do not show good incisor alignment after serial extraction. This supposition is based on Haruki’s study which showed that Phase I treatment involving incisor alignment did result in greater long term stability of the lower incisors. It may therefore be that serial extraction cases that exhibit good incisor alignment after extraction alone may have greater stability but this supposition needs to be tested with appropriate research.

Extractions have criticized as being detrimental to the face. However, in a comparison of serial extraction cases with and without treatment to late premolar extraction cases, there is no difference in facial profile outcome. Most facial flattening occurs
from normal growth. When you consider that the extraction is
done to resolve crowding of 8mm or more per arch, it makes sense
that most of the tooth movement is taken up to resolve crowding,
rather than to retract the incisors. Arch width is not compromised
by extractions. The work by Kim and Gianelly demonstrate that
smile width is not compromised by extractions. Smile widths are
the same for extraction and non-extraction cases.

It is important to recognize that serial extraction requires ongoing
assessment of the growing patient at strategic times. For this to be
successful, the clinician needs to be one step ahead of the crowding
and plan observation/recall appointments appropriately. There is a
need to constantly re-evaluate the patient. Therefore, a good
recall program in conjunction with a well educated parent and
referral source are essential to serial extraction success.
References
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