

## Serial Extraction is it worth to do? A Review of Literature and Case Report

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### ABSTRACT

**Background:** Serial extraction, a technique introduced by Kjellgren in 1948, emerged during a period of limited availability of orthodontists. It aimed to empower general dentists to manage orthodontic cases effectively, alleviating the strain on orthodontic resources.

**Aim:** The objective of this article is to demonstrate the efficacy of serial extractions in addressing significant crowding issues in a young patient as well as presenting the past and the most updated recent literature.

**Case Summary:** Ten-year-old Philipino girl presented with dissatisfaction regarding the appearance of her front teeth. Examination revealed severe crowding in both the upper and lower arches, with minimal overjet and overbite, alongside a Class I molar relationship.

**Treatment Outcomes:** Treatment comprised serial extractions, resulting in enhanced aesthetics, favorable arch alignment, and occlusion maintenance, all while preserving the Class I molar, canine relationship, overjet, and overbite.

**Conclusion:** Despite potential criticisms of this interceptive approach, this case underscores the possibility of achieving positive clinical outcomes in carefully chosen cases. This case emphasizes the potential benefits of considering serial extractions in treatment planning for specific clinical cases in young patients.

### Keyword

Serial extraction, Orthodontic issues, Premolars.

### Introduction and Review of literature

Ideally, by age 7, the American Association of Orthodontists advises that children should have their initial orthodontic assessment when the first signs of orthodontic issues emerge. The primary orthodontic issue often encountered is inadequate tooth alignment stemming from teeth crowding.

Early extraction procedures hold promise in averting tooth misalignment. Serial extraction, a proactive intervention, addresses significant crowding in a mixed dentition stage by systematically removing specific deciduous and permanent teeth according to a predetermined sequence. This process occurs at scheduled intervals tailored to the needs of each unique case. According to reports, Kjellgren was among the first to propose serial extractions in 1948, driven by a perceived scarcity of orthodontists. His aim was to enable general dentists to manage simple cases of crowding

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more efficiently through this procedure, thus alleviating the burden on orthodontists [1].

The optimal criteria for serial extractions encompass the absence of skeletal discrepancies, a significant deficiency in arch length (ranging from 5 to 9 millimeters), normal overbite, Class I malocclusion, and a commitment from the practitioner to see the case through to completion [2].

Dewel emphasized the cautious approach in borderline cases, recommending attempting correction without extraction initially. This approach aims to ensure that no child is put at risk by hastily resorting to a program of serial extraction [3].

Hotz referred to serial extraction as "guidance of eruption" or "guidance of occlusion," underscoring the need for understanding growth and development to direct the teeth as they emerge into occlusion. He asserted that the orthodontic specialty bears the responsibility of educating predoctoral students in the science of guided eruption. With this fundamental knowledge, general practitioners, under orthodontic supervision, can extend the benefits of orthodontic treatment to more children by their general dentist, thereby minimizing the demand upon the orthodontist [4].

Furthermore, Yoshihara et al. observed that natural alterations in dentition following serial extraction could serve therapeutic purposes by correcting or reducing crowding in many Class I cases. However, they advised closely monitoring patient's post-serial extraction. If necessary, they suggested initiating active orthodontic treatment to achieve a satisfactory occlusion [5].

On the contrary, Dale asserted that serial extraction is not as straightforward as commonly perceived and should never be undertaken without a comprehensive diagnosis. Ignoring the fundamental principles of diagnosis will inevitably lead to failure and disappointment. However, when serial extraction is rooted in meticulous diagnosis, conducted with precision, and executed on carefully selected patients, it can serve as an outstanding and beneficial treatment approach [6].

Hayder, in 2010, documented a case that was successfully managed using serial extraction, despite potential criticisms directed towards this interceptive technique. He highlighted that with careful case selection, favorable clinical outcomes can be attained. He noted that there are specific clinical scenarios where incorporating serial extractions into treatment planning can be advantageous and yielding positive results for young patients [7].

Chopra offers a review on the age-old practice of serial extraction or eruption guidance, commonly used to address crowded arches in dental practice. Despite its historical use, the efficacy of this procedure remains controversial, necessitating precise clinical skill for success. The review discusses the importance of proper case selection for serial extraction, its limitations, and the various adjuncts necessary to achieve favorable outcomes. Overall, it

provides insights into optimizing the use of serial extraction in contemporary dental practice [8].

AL-Meida et al. presented a case treated with a serial extraction program during the mixed dentition phase, followed by corrective orthodontic treatment and long-term follow-up. After twenty years, the patient exhibited a harmonious facial appearance and stable anterior-posterior tooth alignment, despite experiencing a deep overbite and minor relapse of anterior tooth crowding, which are common occurrences in long-term orthodontic treatment. The case demonstrated that the serial extraction protocol led to significant aesthetic improvements, boosting the patient's self-esteem and social confidence. Additionally, the cost-effectiveness of this protocol makes it accessible for underprivileged populations. While early correction of tooth crowding through this approach doesn't guarantee permanent stability, minor relapses don't diminish its overall success after 20 years of follow-up [9].

Tulio Silva et al. conducted study aimed to determine how often permanent premolar extraction was necessary in patients undergoing serial extraction of deciduous teeth to correct incisor crowding during the mixed dentition phase, while also examining related factors. Orthodontic records of 70 patients were reviewed, with a focus on associations between permanent tooth extraction and various variables like facial pattern, dental arch relationships, and tooth proportions. Results showed that 70% of patients who had deciduous tooth extraction required permanent tooth extraction. Tooth-arch size discrepancy was found to be significantly linked to the need for permanent tooth extraction, underscoring its importance in treatment planning. Other analyzed variables did not show significant associations with the need for permanent tooth extraction [10].

Kevin et al. compared the effectiveness of orthodontic treatment in patients treated with serial extraction (SE) in the mixed dentition phase versus late premolar extraction (LPE) in the permanent dentition phase. Retrospective chart reviews of 51 SE patients and 49 LPE patients treated with fixed appliances were conducted. The number of appointments, treatment duration, estimated chair time, and Peer Assessment Rating (PAR) scores were analyzed. Results showed that SE patients had significantly lower PAR scores at the start of fixed appliances compared to LPE patients, but there was no significant difference in PAR scores at appliance removal. SE patients had shorter active treatment time but required more total time and appointments compared to LPE patients. Overall, both SE and LPE treatments led to similar final occlusal outcomes, with SE potentially reducing active treatment time but requiring significant observation time before active treatment [11].

Chalakkal et al. described a case involving an 8-year-old girl with severe lower anterior crowding and congenitally missing lower second premolars. Since a conventional serial extraction procedure was not feasible due to the absence of these teeth, a modified approach involving extraction of second deciduous molars was employed to alleviate the crowding. The results of this treatment were deemed nearly satisfactory [12].

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Feldman performed study aimed to analyze the relationship between tooth tipping and occlusal curvature patterns in serial extraction (SE) cases compared to late premolar extraction (LPE) cases and controls. Dental casts and cephalometric radiographs were collected from 90 subjects at three time points: baseline, after natural drift/pre-orthodontics, and after comprehensive orthodontic treatment. Virtual models were created from the casts, and occlusal curves were measured using digital techniques. Results showed that the SE group exhibited distinct patterns of tooth tipping and occlusal curvature compared to the other groups, with smaller radii and specific tipping directions observed. Overall, SE cases tended to have steeper occlusal curves post-treatment, requiring additional time for correction compared to LPE cases [13].

Al Hummayani in 2015 presented a case report highlights a successful treatment using a modified serial extraction approach in the lower arch for a patient with severe crowding and congenitally missing lower permanent second premolars. Instead of removing first permanent premolars, only deciduous mandibular teeth (C, D, and E) were selectively extracted. The space left by the missing second premolars was utilized to alleviate anterior crowding, and the remaining space was naturally closed by the movement of permanent mandibular teeth. In contrast, conventional serial extraction was performed in the upper arch [14].

Moreover, Potrubacz et al. presented a case report presents an 8-year-old female with Noonan syndrome, exhibiting orofacial characteristics such as a skeletal Class III malocclusion, transverse maxillary deficiency, a long face, and severe tooth size-arch length discrepancy. The interceptive orthodontic strategy aimed to tackle these issues with minimal complexity. Treatment involved rapid maxillary expansion and serial extractions in the mandible. The report discusses treatment options, outcomes, and includes a one-year follow-up evaluation [15].

Muhamad and Watted in 2019 provided a comprehensive review on case selection criteria, limitations, and additional techniques necessary for optimal results in serial extraction. However, Serial extraction or eruption guidance, is a traditional method to address crowded arches, remains a staple in dental practice despite ongoing debates over its effectiveness. In order to achieving successful outcomes with this approach demands meticulous clinical expertise [16].

In 2020 Mintenko et al. investigated the impact of different extraction timings on occlusal curves and dental tipping in 85 subjects. Measurements were taken at three points: before extraction (T0), after extraction and drift (T1), and post-treatment (T2), with untreated controls for comparison. Results showed steeper occlusal curves and significant tipping of certain teeth after early extraction, but these differences were corrected by post-treatment. Late extraction had similar effects to early extraction but was fully corrected by treatment. However, mandibular incisor position remained unaffected by extraction timing. They concluded

that, while extraction timing influenced occlusal curves and dental tipping, orthodontic treatment effectively corrected these changes [17].

Further, Mhanna et al. in 2021 carried study aimed to compare orthodontic treatment outcomes between children who received early intervention (deciduous canine extraction) and a control group without intervention. Records of 46 subjects were analyzed. Orthodontic treatment need and complexity were assessed using the ICON index. Results showed no significant differences between the groups in terms of treatment need, complexity, treatment time, or number of visits. Although there was a higher prevalence of permanent tooth extraction in the early intervention group, it did not significantly impact orthodontic outcomes. In conclusion, early deciduous canine extraction does not reduce the need for or complexity of later orthodontic treatment, nor does it shorten treatment time [18].

Furthermore, Thamer et al. in 2021 proposed a modification of the classical serial extraction method by advocating for the extraction of the second premolars instead of the first premolar and believe this modification is particularly beneficial in cases where there is an abnormal eruption sequence. This adaptation aims to optimize the alignment of teeth and improve overall treatment outcomes [19].

Recently in 2022, Schneider and Moser Stated that, early orthodontic intervention is crucial to prevent future complex procedures. Evidence supports the effectiveness of interceptive therapy for various issues like posterior crossbites, Class III malocclusions, Class II malocclusions, open bites, and arch length discrepancies. Simple appliances in the deciduous or early mixed dentition phase can efficiently correct these malocclusions, potentially reducing the need for costly procedures later on. Serial extractions can be beneficial for patients with significant arch length discrepancies. Overall, early orthodontic treatment offers a proactive approach to address orthodontic problems, potentially avoiding the need for more invasive interventions during puberty [20]. Very recently, Hamidaddin in 2023 conducted a Scoping review about the optimal treatment timing in orthodontics and stated that, this review aimed to determine the optimal timing for orthodontic treatment by comparing early versus late intervention across various orthodontic issues. They examined 32 studies focusing on problems like Class II and III malocclusions, cross-bites, and extractions, assessing factors like effectiveness, duration of treatment, and cost-effectiveness. The findings suggest that early intervention isn't universally superior; it should be reserved for specific cases where it offers psycho-social benefits or significantly reduces the severity of issues for comprehensive treatment in permanent dentition [21].

Likewise, very recently, Quinzi et al., in 2023 compared the effects of two treatments for severe dental crowding in children: serial extractions alone versus a combination of maxillary expansion

and serial extractions. 78 subjects were analyzed, including 52 treated for crowding and 26 untreated controls. Both treatments significantly impacted vertical skeletal parameters by altering mandibular and occlusal plane inclination and increasing facial height index. The gonial angle, particularly its superior part, decreased significantly with treatment. However, there were no significant changes in upper and lower incisor inclination. The interincisal angle was smaller in treated groups compared to controls. Overall, both treatment methods had similar significant skeletal effects on vertical cephalometric parameters when performed during the pre-pubertal growth phase [22].

The primary objective of serial extraction is to enhance the likelihood of achieving a stable treatment outcome. However, even with long-term retention, the corrected positions may pose challenges in terms of stability. Consequently, it is preferable for the teeth to naturally erupt into relatively proper positions, a possibility facilitated by serial extraction. This approach can potentially diminish the duration of fixed appliance treatment in the future.

### Aim

This article aims to provide a review of serial extraction, emphasizing its efficacy by presenting a case where serial extractions have been employed.

### Case Presentation

A ten-year-old Filipino girl was directed to the Orthodontic Clinic at Rumaila Hospital because she wasn't happy with how her front teeth looked. Her medical history was unremarkable, but her dental history indicated that she had her deciduous canines and molars removed early to make space in both upper and lower jaws, done one after the other.

### Clinical Assessment

Extra orally, the patient presented with an oval, symmetrically and proportioned face, a convex profile, competent lips, but with deficient mento labial fold and acute nasolabial angle.

Intra orally, she was in the mixed dentition phase, with a Class I molar relationship on both sides. Severe crowding was observed in both the upper and lower arches, with no space available for teeth upper and lower permanent canines [13,23]. The permanent canines in both the upper and lower jaws were palpable. Furthermore, all permanent teeth were free from caries, and both the horizontal and vertical overlap of the front teeth measured 2 mm (Figures 1 and 2).

The absence of cavities in the permanent teeth is positive for the patient's oral health. Further, the observation of severe crowding highlights the need for orthodontic intervention to address the misalignment of teeth.



Figure 1: Extra oral view (starting treatment 10/11/2019).

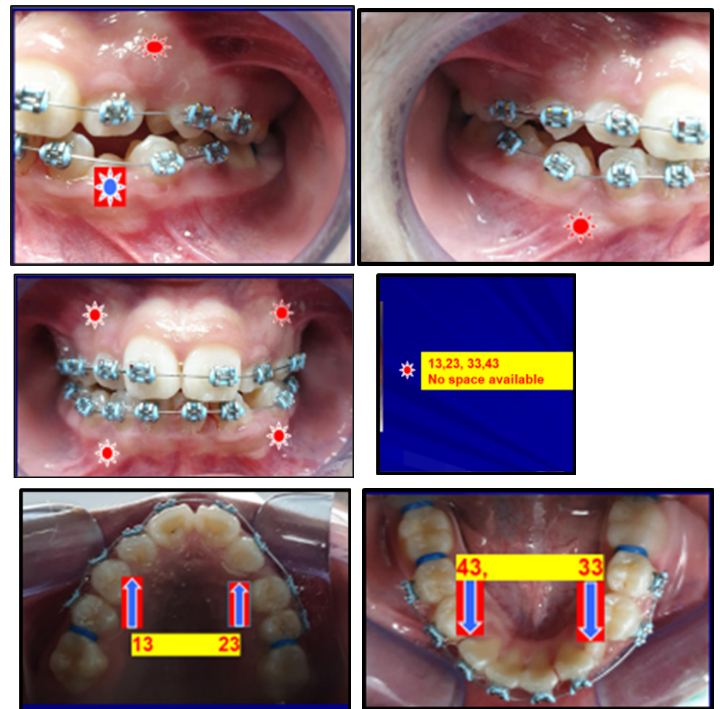


Figure 2: Displays an intraoral view subsequent to bonding the upper and lower arches. The red star denotes the position of the un-erupted permanent canines, which lack adequate space for eruption.

### Radiographic Findings

Panoramic radiography confirmed the presence of all permanent teeth, including the third molars, and verified the presence of all permanent canines and third molars in both jaws. The upper right permanent canine is transposed (Figure 3). The lower right and left third molars need to be assessed to determine if there is sufficient space for eruption or if they are likely to become impacted in the future. The upper third molars require a similar evaluation.

### Diagnosis

The patient presented with Class I malocclusion accompanied by severe crowding in both the maxillary and mandibular arches, alongside minimal overbite and overjet.

### Treatment Objectives

1. To address the crowding issues and enhance alignment in both upper and lower arches
2. To preserve the Class I molar as well as canine relationship, overjet, and overbite

## Treatment Plan

The proposed treatment plan involved serial extractions followed by a subsequent phase of fixed appliance (MBT 0.022 Slot) therapy. This comprehensive approach aimed to achieve improved alignment, interdigitation, and root paralleling. The Consent form was signed and approved by the patient's parents granting permission for the publication of the case.

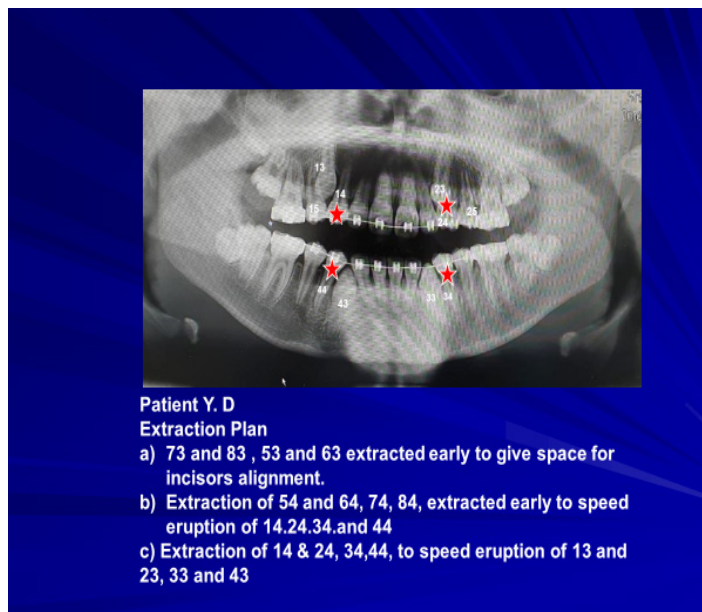
## Treatment Approach

The treatment protocol adhered to the classical steps of serial extraction as recommended by Kjellgren [1].

**Step 1:** Extraction of the deciduous canines was performed to create space for the spontaneous alignment of the incisors. This extraction was carried out when the lateral incisors were partially erupted, typically around seven to eight years of age

**Step 2:** Extraction of the deciduous first molars was undertaken to expedite the eruption of the first premolars. This step was executed when root development was approximately halfway complete, usually occurring around 10 to 11 years of age. Radiographs were recommended to assess the actual level of development.

**Step 3:** Extraction of the permanent first premolars was conducted to accommodate the eruption of the permanent canines. This extraction occurred when the eruption of the permanent canines was confirmed to be underway, typically around 10 to 12 years of age. This was verified through radiographic examination and palpation (Figure 3).



**Figure 3:** Panoramic radiograph at the beginning of the treatment. **Red arrow** shows 23 in transposition.



**Figure 4:** Pretreatment cephalometric radiograph.

## Treatment follow-ups

The following treatment steps were followed:

1. Bonding upper and lower arches with 0.012 Nitinol arch wire for leveling and alignment, along with the placement of separators on first molar teeth to aid in band selection and cementation.
2. Cementation of bands on all first molars in both arches, followed by insertion of 0.016 nitinol archwire.
3. Transition of the upper arch to 0.016 stainless steel wire in both arches.
4. Substitution of upper and lower arch wires with 0.018 wires.
5. Referral for extraction of teeth 14, 24, 34, and 44 to expedite and create space for permanent canines (13, 23, 33, 43).
6. Bonding all erupted canines (13, 23, 33) and placement of open coil to generate adequate space for tooth 43, followed by insertion of 0.016X0.022 SS arch wire (Figure 4).
7. 0.016 Nitinol leveling arch wire for all permanent canines once tooth 43 has fully erupted.
8. Replacement of upper and lower arches with 0.017x0.025 Nitinol wires.
9. Substitution of upper and lower arches with 0.019x0.025 Nitinol wires to optimize torque and angulation in the bracket slot.
10. Insertion of 0.019x0.025 SS arch wire and power chains from teeth 16 to 26, and 36 to 46, to close any remaining spaces in both arches.
11. Removal of brackets from both arches and taking impressions for upper and lower vacuum retainers.
12. Delivery of the retainers along with instructions for their use.



Figure 5A: Extra oral views at debonding.

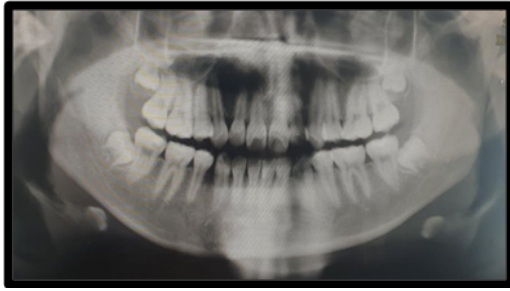


Figure 5B: Intra oral views at debonding.

### Treatment Result

Both the maxillary and mandibular arches were effectively aligned. The patient-maintained Class I molar and canine relationships, with appropriate overjet and overbite. Figure 5 intra and extra oral photographs illustrate the result at debonding, while Figure 6 (OPG) and Figure 7 (Cephalometric radiographs) display the outcomes following active treatment at the time of debonding. Figure 8 through 10 illustrate the treatment results 16 months post treatment. The post treatment radiographs and photographs confirm the stability of the results after 16 months, demonstrating the durability of the orthodontic corrections.

The patient received instructions to utilize vacuum retainers throughout the entire day during the initial year, with exceptions during meals or consumption of hot beverages to prevent damage to the retainer and ensure maintenance of the achieved results. In the subsequent year, the patient was advised to wear the retainers solely during nighttime. This approach allows ample time for complete bone and periodontal ligament organization in the new position.



**Figure 6:** Orthopantomograph (OPG). At debonding.



**Figure 7:** Cephalometric radiograph at debonding.



**Figure 9:** 16 months Post treatment Cephalometric radiograph.



**Figure 10:** 16 months Post treatment Orthopantomograph (OPG).

### Post-retention result after 16 months



**Figure 8A:** Extra oral views 16 months postretention.



**Figure 8B:** Intra oral views 16 months post-retention.

### Discussion

The main objective of orthodontic therapy is to establish a dentition that is both healthy and functional over the long term. Since its introduction in 1948, serial extractions have undergone thorough examination, with numerous studies investigating their effectiveness across different types of dental malalignment, such as Class I and Class II occlusions. It has been suggested that diagnosing issues during the mixed dentition phase presents significant hurdles for practitioners and that only those who can proficiently execute the treatment should undertake serial extraction procedures [3,6,23-26].

Artese in 2019, emphasized that early intervention for certain types of misalignments in the teeth can potentially reduce the duration of treatment or even eliminate the necessity for more complex and expensive procedures in the future. Furthermore, tackling these issues at an early stage can enhance a child's well-being by addressing any psychological and social difficulties linked to the malalignment [27].

Early intervention offers several potential benefits, including enhancing the child's emotional well-being, leveraging the growth potential inherent at this developmental stage, fostering better cooperation with treatment, potentially simplifying subsequent phases, and potentially minimizing the need for extractions during corrective treatment.

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Commencing serial extraction in cases of severe misalignment at an early stage is often deemed justifiable. This approach aims to prevent children from enduring the distress of having severely misaligned and disfigured front teeth, which can potentially lead to psychological trauma. Moreover, addressing such dental issues early on can mitigate any discomfort or self-consciousness a child may feel, especially in social situations like classroom settings where appearance can influence interactions with peers and teachers.

Rather than waiting for all permanent teeth to erupt before initiating treatment, starting early can significantly reduce the extent of disfigurement and promote better dental aesthetics. For instance, by addressing severe misalignments promptly, we can prevent potential adverse impacts on a child's self-esteem and social confidence. This proactive approach not only enhances the child's overall well-being but also ensures a more positive impression during interactions with teachers and peers, fostering a conducive learning environment.

In the past, much criticism regarding the utilization of serial extraction stemmed from insufficient diagnosis, both at the outset and throughout the three- to five-year period of observation and interceptive guidance before comprehensive therapy. However, in contrast to this perspective, the serial extraction approach is deemed efficient, non-iatrogenic, and aesthetically pleasing mechanotherapy, yielding optimal and enduring outcomes [6,28].

For instance, insights from studies by Fanning and Gron have contributed valuable guidelines regarding the optimal timing for tooth removal during serial extraction, particularly emphasizing the emergence of premolars when one-half to three-quarters of their roots are formed [25,29].

Before performing serial extractions, gather all diagnostic records and plan for regular follow-up visits and assessment of the patient's growth and development. Be advised that the recommended timing for referring patients with moderate crowding to an orthodontist for care is in the late, mixed-dentition stage of development. Patients with severe crowding require earlier evaluation for serial extraction [6].

Once serial extractions are determined to be the optimal treatment approach, the removal of all primary canines is recommended. This facilitates natural correction of anterior crowding as adjacent teeth migrate towards the extraction sites. Additionally, it can reduce bimaxillary protrusion, close existing dental open bites, and potentially correct anterior crossbites through a phenomenon known as "driftodontics"[1,5].

The case presented herein exemplifies successful outcomes achievable through the meticulous application of the serial extraction technique, emphasizing the importance of careful patient selection. Furthermore, adherence to the timing of extractions is critical, with thorough evaluation between steps to mitigate the potential impact of unpredictable developmental growth changes.

Wilson et al. [30] conducted a study to track changes in soft tissue profiles over time, comparing three patient groups: those who underwent serial extractions alone (n=28), those who had serial extractions followed by orthodontic treatment (n=30), and those who received orthodontic treatment with late extractions (n=30). The study found that patients with late premolar extractions tended to show more retroclination of the mandibular incisor compared to those in the serial extraction group. However, despite various observed associations, there were no statistically significant differences among the soft tissue profiles of the three groups. Gender differences noted were likely due to normal maturation rather than treatment received [30].

Further, Schneider and Lorez claims that extraction treatments could negatively impact a patient's facial profile or smile width have been effectively refuted in evidence-based literature. The key finding is that extractions themselves do not adversely affect facial or smile aesthetics, provided that extractions are justified, and the closure of extraction sites is properly managed [20].

Furthermore, when refusing to consider extractions can cause considerable unintended damage to both the hard and soft tissues of the mouth. This may involve the development of dehiscence and gingival recessions, root resorption, increased protrusion of the lips, and instability in many patients [30-32].

Before commencing serial extraction, it is noteworthy to mention the indications and contraindications for the procedure. Indications include patients aged 7 to 8 years old with severe crowding of more than 7 mm, a Class I molar relationship, and normal overjet and overbite. Contraindications include Class I malocclusions with slight space deficiency and mild crowding, the presence of skeletal discrepancies in the dental arches, deep overbite or open bite conditions, and congenitally absent permanent teeth in the dental arch as well as dish in face profile and obtuse nasolabial angle [33].

There are several alternatives in the sequence of serial extraction, depending on the degree of crowding or the position of the permanent teeth in relation to the deciduous teeth. The recommended alternatives include a) Extraction of D, C, and 4. b) Extraction of C and D, followed by 4. c) Extraction of C and D, along with enucleation of 4. Where option a: involves removing teeth D, C, and 4 in sequence, which may be suitable for moderate crowding where the positioning of the permanent teeth requires a staged extraction to allow proper alignment.

Further, option b: Extracting teeth C and D first, followed by tooth 4, can be beneficial in cases where immediate relief of crowding is needed, and the sequential extraction helps guide the eruption of the permanent teeth. Furthermore, option c which includes enucleation of tooth 4 along with the extraction of C and D may be indicated in situations where tooth 4 poses a developmental issue or if early intervention is needed to prevent potential complications. However, this alternative is jeopardizing to the child.



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These options should be carefully considered by the orthodontist based on the specific dental and developmental needs of the patient. Addition to the above, modified serial extraction can be performed in cases with congenitally missing second permanent premolars, Where the extraction of the second deciduous molar (E) will be extracted without extraction of the first permanent premolars [12,14]. Hence, extracting only the second deciduous molar helps manage space effectively, facilitating better alignment of the remaining teeth without unnecessary extractions. Furthermore, by avoiding the extraction of the first permanent premolars, this approach preserves essential dental structures, which can contribute to better long-term dental health and stability.

Serial extraction offers several advantages: (1) it permits physiologic tooth movement, (2) it reduces appliance therapy, (3) it shortens the period of retention, (4) it lessens damage to the alveolar bone and the periodontal structures, and (5) it could be used for patients with disabilities who have rejected orthodontic therapy.

On the other hand, there are several disadvantages of serial extraction. Among those (1) increased overbite, (2) lingual tipping of the lower incisors, (3) scar tissue formation in the extraction space, (4) remaining spaces, and (5) exposure of the child to the extraction of 12 teeth. Hence, if serial extraction is not followed by fixed appliance therapy, ideal alignment, root positioning, overbite, and full-space closure usually are not achieved [34,35].

Schedler and Lorenz recommended that; in cases where patients have significant tooth size-arch length differences, it might be more prudent to consider traditional serial extraction alongside or instead of initiating expansion treatments like Rapid Palatal Expanders (RPEs) and lower arch developers such as lip bumpers. Disregarding serial extraction entirely may not be wise, as it can offer distinct advantages for certain patients [20].

## Conclusion

The general practitioner must distinguish between classic serial extraction and more complex clinical scenarios before initiating any serial extraction treatment. Moreover, despite potential criticisms of this interceptive approach, this case highlights the possibility of achieving positive clinical outcomes in carefully selected cases. It emphasizes the potential benefits of incorporating serial extractions into treatment planning for specific clinical scenarios in young patients.

In essence, early intervention through serial extraction not only addresses physical dental issues but also contributes to the psychological and social development of the child. By prioritizing timely treatment, we can alleviate potential sources of distress and enable children to engage confidently in various social and educational settings, thus promoting their holistic growth and well-being,

## Summary

By carefully considering the following points, the orthodontist can enhance the likelihood of successful outcomes with serial extractions in young patients.

### 1. Thorough Assessment

Conduct a comprehensive evaluation of the patient's dental and skeletal development, including radiographic analysis, to determine the appropriateness of serial extraction.

### 2. Individualized Treatment Plan

Tailor the treatment plan to the specific needs of the patient, considering factors such as the degree of crowding, the position of the permanent teeth, and the overall dental and facial aesthetics.

### 3. Monitoring and Timing

Carefully monitor the eruption pattern of the permanent teeth and adjust the timing of extractions to optimize outcomes and minimize potential complications.

### 4. Patient and Parent Education

Educate the patient and their parents about the rationale, process, and expected outcomes of serial extraction, ensuring they understand the benefits and potential risks.

### 5. Interdisciplinary Collaboration

Collaborate with other dental specialists as needed, such as pediatric dentists and oral surgeons, to ensure a comprehensive approach to treatment.

### 6. Post-Extraction Management

Plan for and manage the post-extraction phase, including the use of space maintainers or other orthodontic appliances to guide the proper alignment of the remaining teeth.

### 7. Long-Term Follow-Up

Implement a long-term follow-up plan to monitor the stability of the treatment results and address any emerging issues promptly.

## References

1. Kjellgren B. Serial extraction as a corrective procedure in dental orthopedic therapy. *Acta Odontologica Scandinavica*. 1948; 8: 17-43.
2. Ngan P, Alkire RG, H Fields Jr. Management of space problems in the primary and mixed dentitions. *J Am Dent Assoc*. 1999; 130: 1330-1339.
3. Dewell B. its limitations and contraindications. *Am J Orthod*. 1967; 53: 904-921.
4. Hotz RP. Guidance of eruption versus serial extraction. *Am J Orthod*. 1970; 58: 1-20.
5. Yoshihara T, Matsumoto Y, Suzuki J, et al. Effect of serial extraction alone on crowding: spontaneous changes in dentition after serial extraction. *Am J Orthod Dentofacial Orthop*. 2000; 118: 611-616.

6. Dalea JG. Serial extraction... nobody does that anymore. *Am J Orthod Dentofacial Orthop.* 2000; 117: 564-566.
7. Hashim HA. Management of crowded class 1 malocclusion with serial extractions: report of a case. *J Contemp Dent Pract.* 2010; 11: 41-48.
8. Chopra R. Serial extraction: is it a panacea for crowded arches. *Annals Essences of Dentistry.* 2010; 2: 100-105.
9. Renato Rodrigues de Almeida, Marcio Rodrigues de Almeida, Paula Vanessa Pedron Oltramari-Navarro, et al. Serial extraction: 20 years of follow-up. *J Appl Oral Sci.* 2012; 20: 486-492.
10. Tulio Silva Lara, Cibelle Cristina Oliveira dos Santos, Omar Gabriel da Silva Filho, et al. Serial extraction: Variables associated to the extraction of premolars. *Dental Press Journal of Orthodontics.* 2011; 16: 15-145.
11. Kevin WO Shaughnessy, Lorne D Koroluk, Ceib Phillips, et al. Efficiency of serial extraction and late premolar extraction cases treated with fixed appliances. *Am J Orthod Dentofacial Orthop.* 2011; 139: 510-516.
12. Chalakkal P, Ida de Noronha de Ataide, Akkara F, et al. Modified serial extraction in a case with missing mandibular second premolars and a brief review of related treatment modalities. *J Indian Soc Pedod Prev Dent.* 2013; 31: 126-131.
13. Feldman E. Changes in the occlusal curves secondary to serial extractions compared to late premolar extractions and controls. University of British Columbia. 2014.
14. Al Hummayani FM. Modified serial extraction treatment in a patient with congenitally missing lower second premolars. *J Orthod Sci.* 2015; 4: 92-96.
15. Maciej Iancu Potrubacz, Claudio Chimenti, Laura Marchione, et al. Orofacial findings and serial extraction procedure in Noonan syndrome. *Australasian Orthodontic Journal.* 2017; 33: 97-104.
16. Muhamad AH, Watted N. Serial extraction in orthodontics. *Int J Appl Dent Sci.* 2019; 5: 370-378.
17. Rob Mintenko, David B Kennedy, Jolanta Aleksejuniene, et al. Mandibular dental changes following serial and late extraction of mandibular second premolars. *Angle Orthod.* 2020; 90: 187-193.
18. Mhanna A Aljabab, Muteb Algharbi, Jan Huggare, et al. Impact of early extraction of the deciduous canine on relief of severe crowding. *Angle Orthod.* 2021; 91: 743-748.
19. Thamer E Alzahrani. Modified Serial Extraction in Patient with Sever Crowding: A Case Report. *International Journal of Dentistry and Oral Science.* 2021; 8: 4923-4926.
20. Ute EM Schneider-Moser, Lorenz Moser. Very early orthodontic treatment: when, why and how? *Dental Press J Orthod.* 2022; 27: 22.
21. Hamidaddin MA. Optimal Treatment Timing in Orthodontics: A Scoping Review. *Eur J Dent.* 2024; 18: 86-96.
22. Vincenzo Quinzi, Simone Ettore Salvati, Fabrizio Lerda, et al. Skeletal and dental effects of serial extractions performed with or without maxillary expansion-A retrospective controlled study. *Orthod Craniofac Res.* 2023; 26: 642-649.
23. Mayne WR. Serial extraction-orthodontics at the crossroads. *Dent Clin North Am.* 1968; 12: 341-362.
24. Lloyd ZB. Serial extraction as a treatment procedure. *Am J Orthod.* 1956; 42: 728-739.
25. Fanning EA. Effect of extraction of deciduous molars on the formation and eruption of their successors. *Angle Orthod.* 1962; 32: 44-53.
26. Bishara SE, *Textbook of orthodontics.* 2001.
27. Artese F. A broader look at Interceptive Orthodontics: What can we offer? *Dental Press J Orthod.* 2019; 24: 7-8.
28. Vaden JL, Kiser HE. Straight talk about extraction and nonextraction: a differential diagnostic decision. *Am J Orthod Dentofacial Orthop.* 1996; 109: 445-452.
29. Gron AM. Prediction of tooth emergence. *J Dent Res.* 1962; 41: 573-585.
30. Wilson JR, Little RM, Joondeph DR, et al. Comparison of soft tissue profile changes in serial extraction and late premolar extraction. *Angle Orthod.* 1999; 69: 165-172.
31. Bowman SJ, LE Johnston Jr. The esthetic impact of extraction and nonextraction treatments on Caucasian patients. *Angle Orthod.* 2000; 70: 3-10.
32. Daniel J Rinchuse, Lauren Sigler Busch, Daniel Di Bagno, et al. Extraction treatment, part 1: the extraction vs. nonextraction debate. *J Clin Orthod.* 2014; 48: 753-760.
33. Cameron AC, Widmer RP. *Handbook of pediatric dentistry.* Elsevier Health Sciences. 2013.
34. William R Proffit, Henry Fields, Brent Larson, et al. *Contemporary orthodontics.* Elsevier. 1993.
35. Simon J Little wood, Laura Mitchell. *An introduction to orthodontics.* New York: Oxford University Press. 2001.