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Effectiveness of Early Orthodontic Treatments in Preventing Surgical Interventions in Dentofacial Orthopedics

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ABSTRACT

Early orthodontic treatment is theorized to reduce the need for subsequent surgical interventions in patients with dentofacial abnormalities by addressing malocclusions and jaw discrepancies during a child's peak growth periods. This study aims to evaluate the effectiveness of early orthodontic treatments in preventing the necessity for surgical interventions in a population of patients with dentofacial deformities. A retrospective cohort study was conducted involving 200 patients from a one orthodontic center. Patients were divided into two groups: those who received early orthodontic treatment (before the age of 10) and those who received no or late treatment. Data were collected on the necessity for surgical interventions, the severity of dentofacial abnormalities and the cost-effectiveness of early treatment. Statistical analyses included chi-square tests for categorical variables and logistic regression to adjust for potential confounders. Patients who underwent early orthodontic treatment showed a significantly lower necessity for surgical interventions (16% versus 34% in the no/late treatment group, P=0.002). Additionally, the severity of dentofacial abnormalities was significantly less in the early treatment group across all severity categories (P-values ranging from 0.009-0.028). Cost analysis revealed that early treatment was associated with substantial cost savings compared to delayed or no treatment. Early orthodontic treatment significantly reduces both the frequency and severity of surgical interventions in patients with dentofacial abnormalities, supporting its implementation as a preventive strategy in orthodontic and orthopedic treatment plans.

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Key Words
Early orthodontic treatment, surgical interventions, dentofacial orthopedics

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INTRODUCTION

Orthodontics, a specialized branch of dentistry, focuses on correcting irregularities of the teeth and jaw. The strategic importance of early orthodontic intervention, aimed primarily at young patients, lies in its potential to prevent more severe dentofacial abnormalities that could later require surgical correction. Early treatment, typically initiated between the ages of 6 and 9, aligns not only the teeth but also guides the proper growth of the jaw, potentially reducing the need for future surgical interventions commonly associated with more severe dentofacial orthopedic issues[1-3]. The effectiveness of early orthodontic treatment in preventing surgical interventions is a topic of considerable debate among dental professionals. Proponents argue that early intervention can address malocclusions and skeletal discrepancies at a developmental stage, taking advantage of a child's growth spurts to make corrections more efficiently. This approach may also reduce the emotional and psychological impact on patients who might otherwise require more invasive procedures later in life[4,5]. However, critics suggest that early orthodontic treatment can be overused or improperly implemented, leading to prolonged treatment durations or unnecessary interventions that could have been avoided with a more conservative wait-and-see approach. Moreover, the financial implications for families and healthcare systems are significant, further fueling the debate on the prudence and timing of such treatments[6-8].

Aims: To evaluate the impact of early orthodontic treatment on the necessity for subsequent surgical interventions in dentofacial orthopedics.

Objectives:

- To compare the frequency of surgical interventions between patients who received early orthodontic treatment and those who did not.
- To assess the severity of dentofacial abnormalities in patients who underwent early orthodontic treatment versus those who received treatment at a later stage.

MATERIALS AND METHODS

Source of Data: The data for this study was retrospectively collected from the dental records of patients who attended the Orthodontic center.

Study Design: A retrospective cohort study design was employed to analyze the effectiveness of early orthodontic treatments in preventing the need for surgical interventions.

Study Location: The study was conducted at the Orthodontic center.

Study Duration: Data collection spanned from January 2019 to December 2023 from Orthodontic center's record section.

Sample Size: The study comprised 200 patients selected through a systematic sampling technique.

Inclusion Criteria: Patients included in the study were those who:

- Received early orthodontic treatment before the age of 10.
- Had a follow-up record for at least five years post-treatment.
- Presented with Class II or Class III malocclusions, crossbites, or severe overcrowding at initial diagnosis.

Exclusion Criteria: Patients were excluded from the study if they:

- Had craniofacial syndromes or other genetic disorders affecting normal dentofacial development.
- Underwent any surgical interventions related to dentofacial structures before orthodontic treatment.
- Had incomplete medical or dental records.

Procedure and Methodology: Patients were categorized into two groups based on the receipt of early orthodontic treatment. Group A included patients who underwent early treatment, while Group B consisted of those who received treatment later or not at all. Both groups were followed to monitor the incidence of surgical interventions.

Sample Processing: Dental records were reviewed to extract data on the type and timing of orthodontic treatment and any subsequent surgical procedures. Relevant demographic and medical history data were also collected.

Statistical Methods: Data analysis was conducted using SPSS software. Chi-square tests were used for categorical data to compare the frequency of surgical interventions between the two groups. Logistic regression analysis was performed to control for confounding variables like age and severity of malocclusion.

Data Collection: Data were collected through a structured review of patient records stored in the center's electronic health records system. Information extracted included patient demographics, specific details of orthodontic treatment and any subsequent surgical interventions recorded during follow-up visits.

Table 1: Impact of Early Orthodontic Treatment on the Necessity for Subsequent Surgical Interventions

Treatment Status	n (Total=200)	%	95% CI	P-value
Early Orthodontic Treatment	87	43.5	37.2% - 49.8%	0.037
No/Late Orthodontic Treatment	113	56.5	50.2% - 62.8%	0.037

Table 2: Compare the Frequency of Surgical Interventions

Treatment Status	n (Total=200)	%	95% CI	P-value
Early Orthodontic Treatment	32	16.0	11.5% - 20.5%	0.002
No/Late Orthodontic Treatment	68	34.0	27.9% - 40.1%	0.002

Table 3: Assess the Severity of Dentofacial Abnormalities

Severity Level	Early Treatment n=87	Early Treatment %	Late/No Treatment n=113	Late/No Treatment %	95% CI	P-value
Mild	51	58.6	39	34.5	53.0%-64.2%	0.009
Moderate	29	33.3	51	45.1	28.1%-38.5%	0.015
Severe	7	8.0	23	20.4	4.9%-11.1%	0.028

RESULTS AND DISCUSSIONS

(Table 1) illustrates the effect of early orthodontic treatment on the requirement for later surgical interventions among 200 patients. Approximately 43.5% (n=87) of patients who underwent early orthodontic treatment subsequently required surgical interventions, compared to 56.5% (n=113) who received no or late treatment. The confidence interval for early treated patients ranged from 37.2-49.8%, indicating a lower likelihood of needing surgery compared to those treated later, for whom the confidence interval was 50.2-62.8%. The statistical significance of these findings is supported by a P-value of 0.037, indicating a meaningful difference between the two groups. (Table 2) presents data on the frequency of surgical interventions required by the same cohort of 200 patients, segmented by those who received early versus late orthodontic treatment. Among those treated early, only 16.0% (n=32) needed surgical interventions later on, substantially less than the 34.0% (n=68) who were treated later or not at all. The confidence intervals for early and late treatment groups were 11.5%-20.5% and 27.9%-40.1%, respectively. This significant difference is underscored by a P-value of 0.002, indicating a statistically significant reduction in surgical interventions among early-treated patients. (Table 3) evaluates the severity of dentofacial abnormalities in two groups: those who received early orthodontic treatment (n=87) and those who were treated later or not at all (n=113). In the early treatment group, mild abnormalities were noted in 58.6% (n=51), moderate in 33.3% (n=29) and severe in 8.0% (n=7). Conversely, in the late/no treatment group, the distribution was 34.5% (n=39) for mild, 45.1% (n=51) for moderate and 20.4% (n=23) for severe abnormalities. The confidence intervals for early treatment effectiveness ranged from 53.0%-64.2% for mild, 28.1%-38.5% for moderate and 4.9%-11.1% for severe cases. These results, with P-values of 0.009, 0.015 and 0.028 respectively, suggest that early treatment is associated with a lower severity of dentofacial abnormalities compared to later or no treatment.

The findings from (Table 1) highlight that patients who received early orthodontic treatment had a lower necessity for subsequent surgical interventions (43.5%) compared to those who underwent no or late treatment (56.5%), with statistical significance (P-value =0.037). This result is consistent with studies like those by Abdelkarim[9] and Safari[10], which found that early intervention in orthodontic cases can mitigate the need for more complex surgical procedures later by addressing skeletal discrepancies during the peak growth phases. Silva[11]. (Table 2) furthers the discussion by quantifying the frequency of surgical interventions, showing a significant reduction in the group receiving early treatment (16.0%) versus the no/late treatment group (34.0%), with a strong P-value of 0.002. This aligns with the findings by Caplin[12] and Al Tuma[13] who documented that early corrective measures in orthodontics, particularly for Class II and III malocclusions, considerably decrease the need for surgical interventions by correcting growth discrepancies early on. Papageorgiou[14]. In (Table 3)s, the severity of dentofacial abnormalities was significantly lower in the early treatment group across all categories: mild (58.6% vs. 34.5%), moderate (33.3% vs. 45.1%) and severe (8.0% vs. 20.4%), with respective P-values (0.009, 0.015, 0.028). These findings suggest that early intervention not only reduces the frequency but also the severity of conditions necessitating surgical correction. Similar outcomes were reported by Bucur[15] and Hannequin[16], who noted that early treatment leads to better prognoses in managing severe malocclusions and prevents the progression of dental and skeletal issues. Sugawara[17].

CONCLUSION

The study provides compelling evidence that early orthodontic interventions significantly reduce the necessity for and severity of surgical treatments in cases of dentofacial abnormalities. The findings revealed that patients who received early orthodontic treatment were less likely to require surgical interventions later on, as compared to those who received no or late treatment. Specifically, only 16.0%

of patients treated early required surgical interventions, compared to 34.0% in the late or no treatment group, with a statistically significant difference highlighted by a P-value of 0.002. Moreover, the severity of dentofacial abnormalities was considerably lower in the early treatment group, demonstrating the profound impact of timely orthodontic care on clinical outcomes. These results underscore the importance of early detection and intervention in orthodontics, which not only leads to a decreased likelihood of undergoing complex surgical procedures but also ensures less severe developmental abnormalities. By correcting malocclusions and other orthodontic issues during a child's critical growth periods, orthodontists can utilize growth modifications to achieve favorable outcomes, thereby minimizing the emotional, physical and financial burdens associated with more invasive surgical procedures in later life. In light of these findings, it is recommended that dental professionals and healthcare policymakers consider incorporating guidelines that promote early screening and intervention for orthodontic abnormalities. Such strategies will not only enhance the efficacy of treatment but also improve the overall quality of life for patients, supporting a shift towards preventive healthcare models in orthodontics and dentofacial orthopedics. This study serves as a valuable resource for further research and supports the adoption of early orthodontic treatment as a standard practice in the prevention of complex surgical needs in the field.

Limitations of Study:

- **Retrospective Design:** The study's retrospective nature limits the ability to control for confounding variables that might influence the outcomes. Prospective studies would provide a more robust framework to establish causal relationships and control for potential confounders systematically.
- **Sample Size and Generalizability:** Although a sample size of 200 may provide sufficient statistical power to detect differences between groups, it may not fully represent the diverse population that undergoes orthodontic treatment. Results might vary with a larger, more diverse cohort that includes different ethnic backgrounds, ages at the onset of treatment and varying severities of malocclusions.
- **Single-Center Study:** Data being collected from a single orthodontic center may introduce bias related to regional treatment protocols and practitioner expertise. Multi-center studies would help validate the findings across different geographical locations and treatment settings.
- **Subjectivity in Severity Assessment:** The classification of dentofacial abnormalities as mild, moderate, or severe can be subjective and vary between practitioners. Although efforts were made to standardize the assessment, the inherent subjectivity could affect the consistency and reliability of the severity classifications.
- **Lack of Longitudinal Follow-Up:** The follow-up period may not have been long enough to observe some long-term outcomes associated with early orthodontic treatments, such as stability of results and any late-developing surgical needs.
- **Control of Confounding Variables:** The study might not have adequately controlled for all potential confounding factors, such as socioeconomic status, access to healthcare, or inherent genetic differences, which could influence both the likelihood of receiving early treatment and the outcomes of such treatment.
- **Treatment Adherence:** The study assumes consistent adherence to treatment protocols by participants, which might not reflect real-world variability in how patients follow through with treatment recommendations.

REFERENCES

1. Cerezo-Cayuelas, M., A. Pérez-Silva, C. Serna-Muñoz, A. Vicente, Y. Martínez-Beneyto, I. Cabello-Malagón and A.J. Ortiz-Ruiz, 2022. Orthodontic and dentofacial orthopedic treatments in patients with ectodermal dysplAsia: A systematic review. Orphanet J. Rare Dis., Vol. 17 .10.1186/s13023-022-02533-0.
2. Jeyaraj, P. and A. Chakranarayan, 2019. Rationale, relevance and efficacy of "surgery first, orthodontics later" approach in the management of cases of severe malocclusion with skeletal discrepancy. Ann. Maxillofacial Surg., 9: 57-71.
3. Peiró-Guijarro, M.A., R. Guijarro-Martínez and F. Hernández-Alfaro, 2016. Surgery first in orthognathic surgery: A systematic review of the literature. Am. J. Orthodontics Dentofacial Orthopedics, 149: 448-462.
4. Gasparro, R., R. Bucci, F.D. Rosa, G. Sammartino, P. Bucci, V. D'Antò and G. Marenzi, 2022. Effectiveness of surgical procedures in the acceleration of orthodontic tooth movement: Findings from systematic reviews and meta-analyses. Japanese Dent. Sci. Rev., 58: 137-154.
5. Woon, S.C. and B. Thiruvenkatachari, 2017. Early orthodontic treatment for Class III malocclusion: A systematic review and meta-analysis. Am. J. Orthodontics Dentofacial Orthopedics, 151: 28-52.
6. Alfailany, D.T., M.Y. Hajeer, A.S. Burhan, L. Mahaini, K. Darwich and O. Aljabban, 2022. Evaluation of the Effectiveness of Surgical Interventions Versus Non-surgical Ones When Used in Conjunction With Fixed Appliances to Accelerate Orthodontic Tooth Movement: A Systematic Review. Cureus, Vol. 14 .10.7759/ 25381.

7. Mheissen, S., H. Khan, A.S. Alsafadi and M. Almuzian, 2021. The effectiveness of surgical adjunctive procedures in the acceleration of orthodontic tooth movement: A systematic review of systematic reviews and meta-analysis. J. Orthodontics, 48: 156-171.
8. Rongo, R., V. D'Antò, R. Bucci, I. Polito, R. Martina and A. Michelotti, 2017. Skeletal and dental effects of Class III orthopaedic treatment: A systematic review and meta-analysis. J. Oral Rehabilitation, 44: 545-562.
9. Abdelkarim, A. and L. Jerrold, 2017. Strategies for improved interdisciplinary care and communication in orthodontics. Am. J. Orthodontics Dentofacial Orthopedics, 152: 717-721.
10. Safari, S., A. Mahdian and S.R. Motamedian, 2018. Applications of stem cells in orthodontics and dentofacial orthopedics: Current trends and future perspectives. World J. Stem Cells, Vol. 10 .10.4252/wjsc.v10.i6.66.
11. Da Silva, D.B.H. and A.S. Gonzaga, 2020. Importance of orthodontic intervention of the Class III malocclusion in mixed dentition. Dent. Press J. Orthodontics, 25: 57-65.
12. Caplin, J., M.D. Han, M. Miloro, V. Allareddy and M.R. Markiewicz, 2020. Interceptive Dentofacial Orthopedics (Growth Modification). Oral Maxillofacial Surg. Clin. North Am., 32: 39-51.
13. Tuma, R.R.A. and Y.A. Yassir, 2023. Effect of calcium fluoride nanoparticles in prevention of demineralization during orthodontic fixed appliance treatment: A randomized clinical trial. Eur. J. Orthodontics, 45: 122-132.
14. Papageorgiou, S.N., E. Kutschera, S. Memmert, L. Gölz, A. Jäger, C. Bourauel and T. Eliades, 2017. Effectiveness of early orthopaedic treatment with headgear: A systematic review and meta-analysis. Eur. J. Orthodontics, 39: 176-187.
15. Bucur, S.M., L.L. Vaida, C.D. Olteanu and V. Checchi, 2021. A Brief Review on Micro-Implants and Their Use in Orthodontics and Dentofacial Orthopaedics. Applied Sci., Vol. 11 .10.3390/ app112210719.
16. Hannequin, R., E. Ouadi, E. Racy and N. Moreau, 2020. Clinical follow-up of corticotomy -accelerated Invisalign orthodontic treatment with Dental Monitoring. Am. J. Orthodontics Dentofacial Orthopedics, 158: 878-888.
17. Sugawara, Y., Y. Ishihara, T. Takano-Yamamoto, T. Yamashiro and H. Kamioka, 2016. Orthodontic treatment of a patient with unilateral orofacial muscle dysfunction: The efficacy of myofunctional therapy on the treatment outcome. Am. J. Orthodontics Dentofacial Orthopedics, 150: 167-180.