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SUMMARY WITH CRITICAL APPRAISAL

Orthodontic Treatment for the Management of Pain or Impacted Teeth in Patients with Malocclusion: A Review of Clinical Effectiveness and Guidelines

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Context and Policy Issues

Malocclusion refers to an improper alignment of the upper and lower teeth.[1] Data from the 2007 to 2009 Canadian Health Measures Survey suggested that the prevalence of malocclusion and past orthodontic treatment among Canadian adults aged 20 to 59 years was 25% and 20%, respectively.[2] According to the 2009 to 2010 First Nations Oral Health Survey, the prevalence of malocclusion among First Nations aged 12 years and over was 30.3%, and 98.6% among them received no orthodontic treatment.[3] The most common types of malocclusion in this population were severe crowding (14.9%), anterior cross bite (9.6%), and posterior cross bite (6.9%).[3]

There are several causes for malocclusion, including hereditary, tooth overcrowding, lost teeth, abnormal bite patterns, ill-fitting dental fillings, cleft lip and palate, tumor of mouth and jaw, and impacted teeth.[4] Common conditions of malocclusion are upper protrusion (i.e., over jet), spacing or crowding problems, misplaced midline, open bite, overbite, cross bite, underbite, rotation and transposition.[5] There are three major classes of malocclusion: Class 1 (i.e., upper teeth overlap the lower teeth, most common); Class 2 (i.e., severe overbite); Class 3 (i.e., severe underbite).[1] Malocclusion can cause severe pain upon biting or chewing because a sudden unbalanced pressure that puts too much strain on a tooth may cause inflammation in the pulp chamber.[6]

Severe malocclusion requires orthodontic treatment or combination of surgery and orthodontic (i.e., orthognathic) to correct the position of the teeth, and to eliminate the strain on the teeth, jaws and muscles in order to improve oral health-related quality of life, self-esteem and psychological health.[7,8] It remains unclear if pain and the impacted teeth associated with malocclusion can be effectively managed by orthodontic treatment.

The aim of this report is to review the clinical effectiveness and evidence-based guidelines on the use of orthodontic treatment for the management of pain or impacted teeth in patients with malocclusion.

Research Questions

1. What is the clinical effectiveness of orthodontic treatment for the management of pain in patients with malocclusion?
2. What is the clinical effectiveness of orthodontic treatment for impacted teeth associated with malocclusion?
3. What are the evidence-based guidelines regarding the use of orthodontic treatments for the management of pain or impacted teeth in patients with malocclusion?

Key Findings

The evidence suggested that orthodontic or orthodontic-surgical treatment of severe malocclusion in adolescents and adults significantly improved all seven domains of the Oral Health Impact Profile (OHIP-14), including physical pain and physical disability. Decreased facial pain was associated with the improvement of OHIP-14

severity. Given the methodological limitations of the identified studies, the findings should be interpreted with caution. Literature on the clinical effectiveness of orthodontic treatment for impacted teeth associated with malocclusion or evidence-based guidelines were not identified.

Methods

Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2017, Issue 5), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and May 13, 2017. Internet links were provided, where available.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Q1 & Q3: Patients (any age) with pain associated with malocclusion, with or without impacted teeth Q2 & Q3: Patients (any age) with malocclusion and impacted teeth Subgroups of interest: • Children and adolescents < 18 years old • Adults ≥ 18 years old • First Nations and Inuit, Indigenous populations, Aboriginal population, American Indian/Alaska Native
Intervention	Orthodontic treatment (e.g., braces, appliances) with or without oral surgery
Comparator	Q1 & Q2: No orthodontic treatment; orthodontic treatments compared with each other; oral surgery alone; tooth extraction Q3: No comparator required
Outcomes	Q1 & Q2: Clinical effectiveness (e.g., pain relief, resolution of impacted teeth) Q3: Evidence-based guidelines
Study Designs	Health technology assessments (HTAs), systematic reviews (SRs), meta-analyses (MAs), randomized controlled trials (RCTs), non-randomized studies, and evidence-based guidelines

Exclusion Criteria

Studies were excluded if they did not satisfy the selection criteria in Table 1, and if they were published prior to 2012. Conference abstracts or duplicates of publication of the same study were excluded.

Critical Appraisal of Individual Studies

The Downs and Black checklist was used to assess the quality of non-randomized controlled studies.[9]

Summary of Evidence

Quantity of Research Available

A total of 221 citations were identified in the literature search. Following screening of titles and abstracts, 213 citations were excluded and eight potentially relevant reports from the electronic search were retrieved for full-text review. No potentially relevant publications were retrieved from the grey literature search. Of these potentially relevant articles, three publications were excluded for various reasons, while five studies with a before-and-after study design met the inclusion criteria and were included in this report. Appendix 1 describes the PRISMA flowchart of the study selection.

Summary of Study Characteristics

The characteristics of the included studies[10-14] are summarized below and presented in Appendix 2.

Study Design

All included studies were of before-and-after design, and they each enrolled patients from a single centre.[10-14]

Country of Origin

Two studies were conducted in Finland,[10,14] one was from New Zealand[11] and two were from China.[12,13]

Population

Patient population included adolescent and adult patients with a mean age ranging from 14.5[11] to 37.5[10] years and sample size ranging from 30[11] to 81.[13] All studies included standard patients with severe malocclusions, except one study also included patients with severe skeletal discrepancies or with cleft lip/palate as reasons for malocclusion.[11] One study included patients who had little or no need, borderline need, and actual need for orthodontic treatment.[12] Data of patients, who required orthodontic treatment, therefore, were presented in the findings.[12]

Interventions and Comparators

The interventions were the conventional orthodontic or orthodontic-surgical treatment, and the outcomes were assessed before and after treatment.

Outcomes

In all studies, the clinical outcome was the oral health-related quality of life (OHRQoL) as measured by the short form of the Oral Health Impact Profile (OHIP-14). OHIP-14 has seven conceptualized domains, such as functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. One study also include the intensity of facial pain measured by visual analog scale (VAS).[10] Other outcomes, such as severity of temporal mandibular disorders,[10] esthetic satisfaction,[14] and Aesthetic Component of the Index of Orthodontic Treatment Need[14] were measure but were out of scope for this report.

Treatment Duration

Three studies[10,11,14] reported treatment duration, ranging from 2 to 3 years.

Analysis

In all studies, the analyses of study endpoints were performed on a per protocol basis, where adequate pre- and post-treatment data (i.e., questionnaires and clinical examinations) were included. One study[12] presented a sample size calculation to obtain sufficient power for the primary outcome.

Summary of Critical Appraisal

The summary of the quality assessment for the included studies are briefly described below, and presented in Appendix 3.

Reporting

All studies were explicit in reporting the objective, description of main outcomes and findings, and the probability values. None of the studies provided a detailed description of the patient characteristics, the interventions of interest, the main confounders in each group of patients, adverse events, and the characteristics of patients lost to follow-up. Three studies[10,12,14] did not provide the estimates of the random variability of the data for the main outcomes (i.e., confidence intervals or standard deviations).

External validity

Across all studies, it was unclear if the study participants were representative of the entire population from which they were recruited. Further, the staff, places and facilities, where the patients were treated, seemed to be representative of the treatment the majority patients received.

Internal validity

All the studies used appropriate statistical tests to assess the main outcomes. The outcome measures used in all studies were validated and reliable. However, since the included studies were of before-and-after study design with no control group, many items of the internal validity relevant to a randomized controlled trial, cohort study and case control study were not applicable. Thus, there might be a risk of selection, performance, attrition, detection or reporting bias.

Power

All studies, except one,[12] did not report the power calculation for the primary outcome, and it, therefore, was unclear if those studies[10,11,13,14] had sufficient power to detect a clinically important effect where the probability value for a difference being due to chance in less than 5 percent.

Summary of Findings

The main findings and conclusions of the included studies are presented in Appendix 4.

Question 1: What is the clinical effectiveness of orthodontic treatment for the management of pain in patients with malocclusion?

Oral Health-Related Quality of Life Measured with OHIP-14

Orthodontic or orthodontic-surgical treatment of severe malocclusion was associated with significant improvement in the overall OHIP-14 severity scores in all studies.[10-14] The scores of all seven domains of OHIP-14, including physical pain, also significantly improved after treatment. Significant improvement in physical pain was observed in all three groups of patients with Class 1, Class 2 and Class 3 malocclusion after comprehensive orthodontic treatment.[13] In one study,[11] the greatest improvement in OHIP-14 severity scores occurred in patients with severe skeletal discrepancies followed by patients with severe malocclusion, while patients with a cleft lip or palate experienced the least improvement.

Oral Health-Related Quality of Life Measured with the Intensity of Facial Pain

The intensity of facial pain assessed by VAS was significantly improved after orthodontic or orthodontic-surgical treatment in patients with severe malocclusion.[10] The decrease in VAS was significantly associated with improvement in OHIP-14 severity, particularly with improvement in physical pain, physical disability and social disability.[10]

Adverse Events

None of the studies reported adverse events associated with orthodontic treatment.

Question 2: What is the clinical effectiveness of orthodontic treatment for impacted teeth associated with malocclusion?

No relevant literature was identified.

Question 3: What are the evidence-based guidelines regarding the use of orthodontic treatments for the management of pain or impacted teeth in patients with malocclusion?

No relevant literature was identified.

Limitations

All the included studies were of before-and-after study design with no treatment control group. The treatment effect, therefore, may be overestimated by the lack of a control group. Due to the strong desire of patients with severe malocclusion to

undergo orthodontic treatment, their behavior may change in compliance with the treatment, leading to significant improvement in outcomes (i.e., Hawthorne effect). The sample population in the included studies had relatively high OHIP-14 baseline scores, which may limit the generalizability of the findings to patients with more severe malocclusion. Evidence on First the Nations population was not found. Further, literature on the clinical effectiveness of orthodontic treatment for impacted teeth associated with malocclusion, and evidence-based guidelines were not identified.

Conclusions and Implications for Decision or Policy Making

The evidence from pre-post studies suggested that orthodontic or orthodontic-surgical treatment of severe malocclusion improved OHRQoL measured with OHIP-14 in adolescents and adults. All seven domains of OHIP-14, including physical pain and physical disability, were significantly improved after treatment. Facial pain also decreased and was associated with the improvement of OHIP-14 severity. Given the aforementioned limitations of the evidence, the findings should be interpreted with caution. Multi-centre controlled trials of high quality with population of broader categories of malocclusion severity and larger sample sizes are needed. Qualitative and quantitative studies are also needed to investigate the effect of orthodontic treatment for impacted teeth associated with malocclusion.

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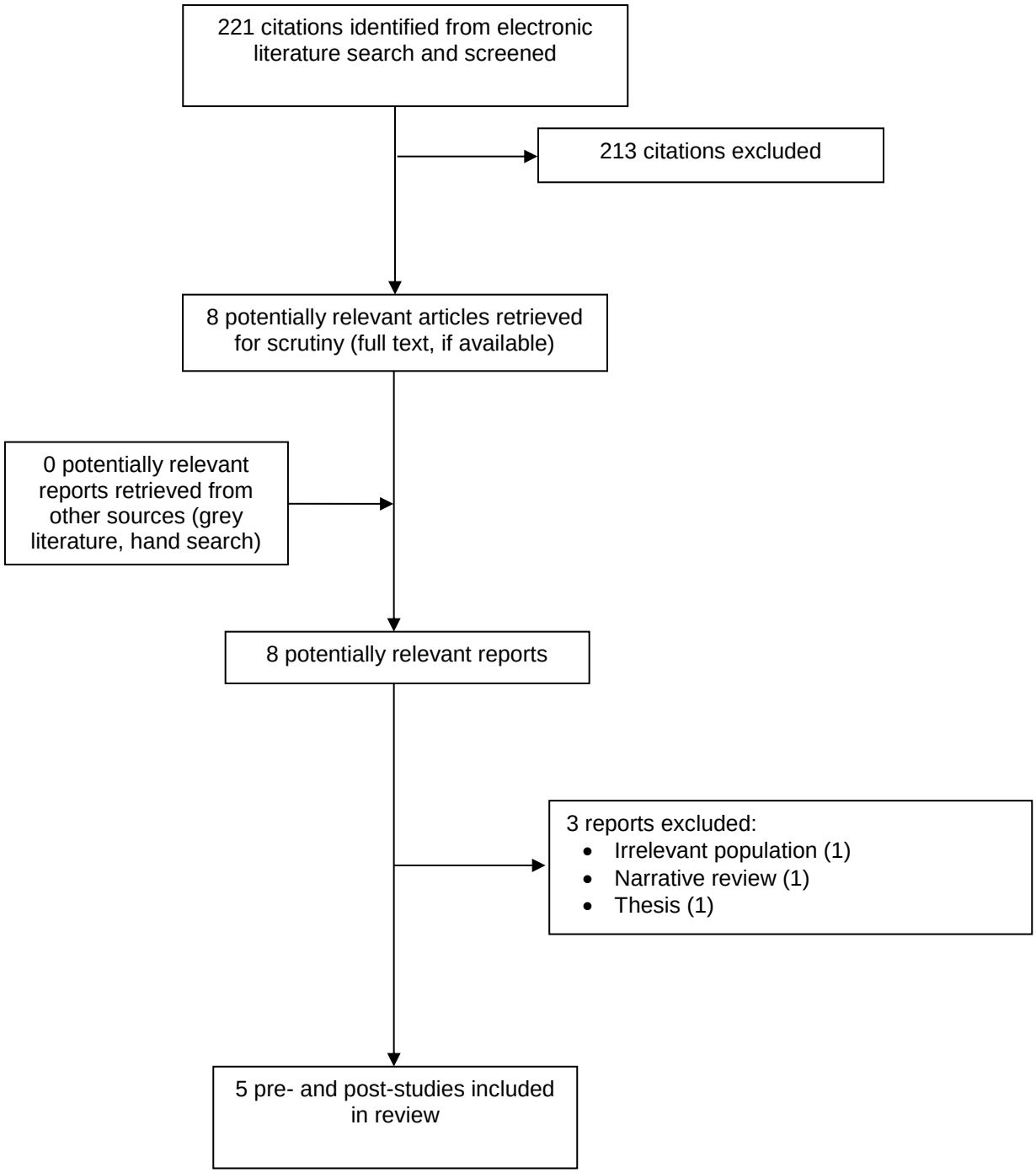
Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Studies

Table A1: Characteristics of Included Primary Studies

First Author, Publication Year, Country, Study Name (if reported), Funding	Study Design and Analysis	Patient Characteristics	Interventions	Comparators	Clinical Outcomes
Silvola et al., 2016[10] Finland Source of funding: Planmeca group and the Finnish Doctoral Program in Oral Sciences (FINDOS)	Before-and-after, single center Recruitment period: 2001 to 2004 Analysis: Only patients with adequate pre and post-treatment data Sample size calculation: NR Treatment duration: average 3 years	Adult patients (n=64) with severe malocclusion - Mean age: 37.5 years (range = 18 to 64 years) - Gender: 46 females, 18 males - Orthognathic (n=44) - Orthodontic (n=20) - Malocclusion types: Extreme overjet/retro gnathic mandible (n=12), anterior open bite (n=12), traumatic deep bite (n=16), anterior cross bite (n=10), unilater crossbite/Severe asymmetry (n=12), oligodontia (n=2)	Conventional orthodontic treatment Combined orthodontic and surgical treatment (orthognathic)	Before treatment	OHRQoL measured with - OHIP-14 - Intensity of facial pain (VAS) - Severity of TMD (Helkimo's anamnestic [Ai] and clinical [Di] dysfunction indices) OHIP has seven conceptualized domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap
Antoun et al., 2015[11] New Zealand Source of funding: NR	Before-and-after, single center Recruitment period: 2005 to 2007 Analysis: pre and post-treatment data Sample size calculation: NR Treatment duration: before and after	Patients with severe malocclusions (n=30) - Mean age: 14.5 years - Gender: 13 females, 17 males - Mean DAI: 45.5 Patients with cleft lip/palate (n=24) - Mean age: 12.6 years - Gender: 10 females, 14 males	Conventional orthodontic treatment Combined orthodontic and surgical treatment (orthognathic)	Before treatment	OHRQoL measured with OHIP-14 (before and after treatment within a 3-month window)

First Author, Publication Year, Country, Study Name (if reported), Funding	Study Design and Analysis	Patient Characteristics	Interventions	Comparators	Clinical Outcomes
	treatment (22 to 34 months)	- Mean DAI: 45.4 Patients with cranial facial deformities required surgery and orthodontic treatment (n=29) - Mean age: 19.0 years - Gender: 14 females, 15 males - Mean DAI: 56.6			
Chen et al., 2015[12] China Source of funding: National Natural Science Foundation of China, Health and Family Commission of Shenzhen Municipality and Science and Technology Innovation Commission of Nanshan Municipality	Before-and-after, single center Recruitment period: NR Analysis: pre and post-treatment data Sample size calculation: Yes Treatment duration: NR	Adult patients (n=190) with malocclusion with little or no treatment need (n=41), borderline (96), and actual need for orthodontic treatment (n=53) - Mean age: 20.8 years - Gender: 109 females, 81 males	Orthodontic treatment	Before treatment	OHRQoL measured with OHIP-14 (Chinese version)
Zheng et al., 2015[13] China Source of funding: National Natural Science Foundation of China	Before-and-after, single center Recruitment period: NR Analysis: pre and post-treatment data Sample size calculation: NR Treatment duration: NR	81 patients underwent orthodontic treatment - Age: 15 to 24 years - Gender: 41 females and 40 males - Divided into three groups based on the type of Angle classification: Class I (n=35), Class II (n=32), and Class III (n=14)	Orthodontic treatment	Before treatment	OHRQoL measured with OHIP-14 (Chinese version)

First Author, Publication Year, Country, Study Name (if reported), Funding	Study Design and Analysis	Patient Characteristics	Interventions	Comparators	Clinical Outcomes
Silvola et al., 2014[14] China Finland Source of funding: Planmeca group and the Finnish Doctoral Program in Oral Sciences (FINDOS)	Before-and-after, single center Recruitment period: 2002 to 2006 Analysis: Only patients with adequate pre and post-treatment data Sample size calculation: NR Treatment duration: average 2 years Follow-up period: average 5 years	Adult patients (n=52) with severe malocclusion - Mean age: 37.4 years (range = 18 to 61 years) - Gender: 36 females, 16 males - Orthognathic (n=38) - Orthodontic (n=14)	Conventional orthodontic treatment Combined orthodontic and surgical treatment (orthognathic)	Before treatment	- OHRQoL measured with OHIP-14 - Esthetic satisfaction (100-mm VAS) - Aesthetic Component (AC) of the Index of Orthodontic Treatment Need rated by laypersons, dental students and orthodontics - Questionnaires given before and on average 3.1 years after treatment

NR = not reported; OHIP-14 = Short Form of The Oral Health Impact Profile; OHRQoL = oral health-related quality-of-life; TMD = temporal mandibular disorders; VAS = visual analog scale

Appendix 3: Quality Assessment of Included Studies

Table A2: Quality Assessment of Primary Studies

Downs and Black Checklist [9]	Silvola et al., 2016[10]	Antoun et al., 2015[11]	Chen et al., 2015[12]	Zheng et al., 2015[13]	Silvola et al., 2014[14]
Reporting					
1. Is the hypothesis/aim/objective of the study clearly described?	Yes	Yes	Yes	Yes	Yes
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?	Yes	Yes	Yes	Yes	Yes
3. Are the characteristics of the patients included in the study clearly described in the Introduction or Methods section?	No	No	No	No	No
4. Are the interventions of interest clearly described in the Introduction or Methods section?	No	No	No	No	No
5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?	No	No	No	No	No
6. Are the main findings of the study clearly described?	Yes	Yes	Yes	Yes	Yes
7. Does the study provide estimates of the random variability in the data for the main outcomes?	No	Yes	No	Yes	No
8. Have all important adverse events that may be a consequence of the intervention been reported?	No	No	No	No	No
9. Have the characteristics of the patients lost to follow-up been described?	No	No	No	No	No
10. Have 95% CIs and/or actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Yes	Yes	Yes	Yes	Yes
External validity					
11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	UTD	UTD	UTD	UTD	UTD
12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	UTD	UTD	UTD	UTD	UTD
13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority patients received?	Yes	Yes	Yes	Yes	Yes
Internal validity – bias					
14. Was an attempt made to blind study subjects to the intervention they have received?	NA	NA	NA	NA	NA
15. Was an attempt made to blind those measuring the main outcomes of the intervention?	NA	NA	NA	NA	NA
16. If any of the results of the study were based on “data	No	No	No	No	No

Downs and Black Checklist [9]	Silvola et al., 2016[10]	Antoun et al., 2015[11]	Chen et al., 2015[12]	Zheng et al., 2015[13]	Silvola et al., 2014[14]
dredging", was this made clear?					
17. In trials and cohort studies, do the analyses adjust for different lengths of the follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?	NA	NA	NA	NA	NA
18. Were the statistical tests used to assess the main outcomes appropriate?	Yes	Yes	Yes	Yes	Yes
19. Was compliance with the interventions reliable?	NA	NA	NA	NA	NA
20. Were the main outcome measures used accurate (valid and reliable)?	Yes	Yes	Yes	Yes	Yes
Internal validity – confounding (selection bias)					
21. Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?	NA	NA	NA	NA	NA
22. Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	NA	NA	NA	NA	NA
23. Were the subjects randomized to the intervention groups?	NA	NA	NA	NA	NA
24. Was the randomized intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?	NA	NA	NA	NA	NA
25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	UTD	UTD	UTD	UTD	UTD
26. Were losses to patients to follow-up take into account?	No	No	No	No	No
Power					
27. Was a power calculation reported for the primary outcome?	No	No	Yes	No	No
28. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance in less than 5 percent?	UTD	UTD	Yes	UTD	UTD

NA = not applicable; UTD = unable to determine

Appendix 4: Main Study Findings and Author's Conclusions

Table A3: Summary of Findings of Included Primary Studies

<table>
<tr><th>Main Study Findings</th><th>Author's Conclusions</th></tr>
<tr><td colspan="2">Silvola et al., 2016[10]</td></tr>
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Mean facial pain (VAS)

	All patients	Orthognatic	Orthodontic
Before	3.1	3.2	2.9
After	0.9	0.6	1.5
Change	-2.2*	-2.6*	-1.4*

Significant difference, *p<0.05

OHIP-14 and correlations between changes in dimensions and change in facial pain intensity (VAS)

	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	1.8	4.3	3.9	1.6	2.8	1.9	1.8
After	0.7	1.8	0.9	0.2	0.4	0.2	0.3
Change	-1.1*	-2.5*	-3.0*	-1.4*	-2.4*	-1.7*	-1.5*
Facial pain (VAS) r	0.165	0.253†	0.239	0.263†	0.210	0.281†	0.185
p	0.207	0.044	0.059	0.037	0.102	0.027	0.147

Significant difference, *p<0.05

r, Spearman correlation coefficient for association between changes in OHIP dimensions and facial pain (VAS), †p<0.05

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"Treatment of severe malocclusion seemed to improve OHRQoL via decreased facial pain. Decreased facial pain was associated especially with improved OHRQoL dimensions of physical pain, physical disability and social disability." (p44)[10]

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<tr><td colspan="2">Antoun et al., 2015[11]</td></tr>
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OHIP-14 of standard patients with severe malocclusions

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	11.60	1.23	1.50	3.00	0.73	2.67	1.27	1.20
After	3.63	0.77	0.67	0.70	0.23	0.67	0.37	0.23
Change	7.97†	0.47	0.83*	2.30†	0.50	2.00†	0.90	0.97*
Effect size[a]	+1.11	+0.47	+0.58	+1.21	+0.46	+1.15	+0.63	+0.90

OHIP-14 of cleft lip/palate patients with cranial facial deformities

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	10.50	1.75	1.25	2.54	0.75	1.92	1.17	1.1
After	7.25	1.37	1.29	1.75	0.33	1.33	0.58	0.58
Change	3.25	0.38	-0.04	0.79	0.42	0.58	0.58	0.54
Effect size[a]	+0.52	+0.37	-0.03	+0.62	+0.44	+0.43	+0.63	+0.51

OHIP-14 of surgery patients with severe skeletal discrepancies

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	19.52	2.03	3.10	4.83	1.59	3.93	2.00	2.03
After	2.03	0.24	0.86	0.48	0.10	0.24	0.03	0.07

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"The effect of orthodontic treatment in OHRQoL varies for different patient groups even after adjusting for age and sex. The greatest improvement in OHRQoL occurred in adults with a need for orthognatic surgery, whereas the least improvement seemed to occur in adolescents with cleft lip,

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Main Study Findings	Author's Conclusions

Change	17.48†	1.79†	2.24†	4.35†	1.48†	3.69†	1.97†	1.97†
Effect size[a]	+2.59	+1.36	+1.25	+2.73	+1.58	+2.65	+1.72	+2.01

Significant difference, *p<0.05 and †p<0.01
[a] Effect sizes: < 0.2: minimal; 0.2 to 0.49: small; 0.5 to 0.8: moderate; >0.8: large

cleft palate, or cleft lip and palate." (p568)[11]

Chen et al., 2015[12]

OHIP-14 of patients with severe malocclusions required orthodontic treatment

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	12.75	1.85	1.64	3.51	1.13	2.21	1.25	1.17
After	3.70	0.43	0.25	1.34	0.45	0.66	0.36	0.29
Change	-9.05*	-1.42*	-1.39*	-2.17*	-0.68*	-1.55*	-0.89*	-0.88*

Significant difference, *p<0.05

"Malocclusion has a significant negative impact on OHRQoL and its domains. The greatest impact was seen in the psychological discomfort and psychological disability domains." (p990)[12]

Zheng et al., 2015[13]

OHIP-14 of patients with class I malocclusions

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	15.32	1.77	1.60	3.94	2.57	4.26	0.63	1.14
After	3.23	0.54	0.57	0.63	0.63	0.49	0.34	0.46
Change	-12.2*	-1.23*	-1.03*	-3.31*	-1.94*	-3.77*	-0.29	-0.68*

Significant difference, *p<0.001

OHIP-14 of patients with class II malocclusions

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	16.42	1.75	2.09	3.56	3.56	3.13	0.66	0.61
After	3.12	0.50	0.50	0.53	0.56	0.66	0.31	0.54
Change	-13.3*	-1.25*	-1.59*	-3.03*	-3.00*	-2.47*	-0.35	-0.07

Significant difference, *p<0.001

OHIP-14 of patients with class III malocclusions

	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	17.11	1.57	1.43	3.93	4.14	4.50	0.93	0.48
After	2.98	0.50	0.57	0.71	0.36	0.43	0.57	0.32
Change	-14.1*	-1.07*	-0.86*	-3.22*	-3.78*	-4.07*	-0.36*	-0.16

Significant difference, *p<0.001

"For the overall OHIP-14 score, class I, II and III showed significant decrease (P<0.001) during the study period. Significant reduction (P<0.001) were also observed in all seven OHIP-14 domains of three groups except for social disability in class I and class II, handicap in class II and class III (P>0.05)." (p3)[13]

Main Study Findings	Author's Conclusions
Silvola et al., 2014[14]	

OHIP-14 of patients with severe malocclusions

All patients	Overall	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Before	18.4	1.9	4.6	3.8	1.8	2.7	2.0	1.7
After	4.7	0.8	1.8	1.0	0.3	0.6	0.3	0.3
Change	-13.7*	-1.1*	-2.8*	-2.8*	-1.5*	-2.2*	-1.7*	-1.4*

Significant difference, *p<0.001

All patients	**Esthetic satisfaction**	**AC rated by laypersons**	**AC rated by dental students**	**AC rated by orthodontists**
Before	64.3	5.6	5.8	6.0
After	18.9	3.2	2.7	2.3
Change	-45.4*	-2.4*	-3.1*	-3.7*

Significant difference, *p<0.001

"Improvement in esthetic satisfaction due to the treatment of severe malocclusion improves oral health-related quality of life, particularly by decreasing psychological discomfort and psychological disability." (p594)[14]

AC = Aesthetic component; OHIP-14 = Short Form of The Oral Health Impact Profile; OHRQoL = oral health-related quality-of-life; TMD = temporal mandibular disorders; VAS = visual analog scale