

Systematic reviews & Meta-analysis

15/07/2004

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The Review article

An attempt to synthesise the results and conclusions of two or more publications on a given topic

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Reasons to read and use reviews

- Sheer volume of literature
- Save time doing exhaustive literature researches
- Minimise publication bias
- BUT - problems exist

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What if one...

1. Pose one or more questions or hypotheses a priori

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- 4. Combine and compare extracted relevant data**

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 - and if the data cannot be combined, assess the strength of the evidence and use these to evaluate results
- 5. Make conclusions based on results and/or the presence or absence of supporting evidence**

= Systematic review

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Medline Aug 2002

Reviews (n=1 020 815)

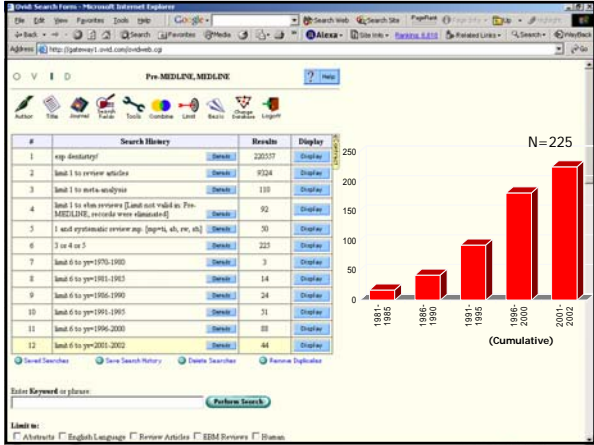
Systematic Reviews (n=2589)

→

Meta-analyses (9474)

12

What have we learned from systematic reviews in Dentistry?



Topics (n=236)

- Pain (n=51)
- Periodontology (n=31)
- Restorative dentistry (n=28)
- Caries (n=23)
- Fluorides (n=17)
- Orthodontics (n=16)
- Implant-based prosthetics (n=11)
- Antibiotics, acupuncture, bone, infection control, oral medicine, sealants, sedation, treatment decisions, toxicology, TMD...

Guided tissue regeneration

GTR attachment gain compared to open flap debridement

Laurell et al. *J Periodontol* 1998: 2.7 mm

Uncontrolled and unblinded studies

Cortellini et al. *Periodontology* 2000 2000: 1.6 mm

Unclear selection criteria for studies

Inclusion of studies of short duration

Needleman et al. *Cochrane Review* 2001: 1.1 mm

Randomised, controlled trials

Trials only comparing GTR vs flap debridement

Trials > 12 months

Furcation involvements excluded

Studies specifically treating early onset diseases excluded

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We have learned:

- Selection of studies to include in reviews will reflect conclusions
- Study methodology aspects will reflect conclusions
- Need to focus on better methodological design of studies

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Splints

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CRITICAL REVIEWS IN ORAL BIOLOGY & MEDICINE

content delivery

Articles

Oral splints: the crutches for temporomandibular disorders and bruxism?

T. T. Das and G. J. Lajtha

Faculty of Dentistry, University of Toronto, Ontario, Canada

Despite the extensive use of oral splints in the treatment of temporomandibular disorders (TMD) and bruxism, their mechanisms of action remain controversial. Various hypotheses have been proposed to explain their apparent efficacy (i.e., true therapeutic value), including the repositioning of occlusal surfaces to the vertical axis, reduction in the electromyographic activity of the masticatory muscles, modification of the patient's "habit" and behavior, and changes in the patient's cognition. Following a comprehensive review of the literature, it is concluded that any of these theories is either poor or unconvincing, while the issue of their efficacy for oral splints remains unsettled. However, the results of a controlled clinical trial support to the effectiveness (i.e., the patient's perception of the positive change which are perceived to have occurred during the trial) the stabilizing splint in the control of myofascial pain. In light of the data supporting their effectiveness but not their efficacy, oral splints should be used as an adjunct for pain management rather than a definitive treatment. For sleep bruxism, it is prudent to limit their use as a habit management aid and to prevent/limit dental damage potentially induced by the device. Future research should study the natural history and etiology of TMD and bruxism, so that specific treatments for these disease can be developed.

199 refs

PAIN

www.elsevier.com/locate/pain

0950-2688(1999)048:500

Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials

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Received 22 January 1999; received in revised form 17 June 1999; accepted 25 June 1999

54 refs

Abstract

Occlusal treatments (occlusal splints and occlusal adjustment) are controversial but widely used treatment methods for temporomandibular disorders (TMD). To investigate whether studies are in agreement with current clinical practices, a systematic review of randomized controlled trials (RCT) of occlusal treatment studies from the period 1966 to March 1999 was undertaken. Eighteen studies met the inclusion criteria, 14 on splint therapy, and 4 on occlusal adjustment. The trials were scored using the quality scale presented by Amtrak et al., 1996a (A.A., Amtrak, J. Tang, T.C. Chalmers, Quality assessment of randomized control trials in dental research. J. Malo, J. Pössiö, J. Pössiö, 1996a:21305-3140). The overall quality of the trials was fairly low, the mean quality score was 0.43/1.00 (range 0.12-0.78). The most obvious methodological shortcomings were inadequate blinding, small sample sizes, short follow-up times, great diversity of outcome measures and numerous control treatments, some of unknown effectiveness. Splint therapy was found superior to 3, and comparable to 12 control treatments, and superior or comparable to 4 passive controls, respectively. Occlusal adjustment was found comparable to 2 and inferior to one control treatment and comparable to passive control in one study. Because of the methodological problems, only suggestive conclusions can be drawn. The use of occlusal splints may be of some benefit in the treatment of TMD. Evidence for the use of occlusal adjustment is lacking. There is an obvious need for well-designed controlled studies to analyze the current clinical practices. © 1999 International Association for the Study of Pain. Published by Elsevier Science B.V.

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Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials

Forsell H, Kalso E, Koskela P, Vehmanen R, Paukka P, Alanen P

55 refs

12 refs appear in both papers

199 refs

Cited Author	Cited Work	Volume	Page	Cited Author	Cited Work	Volume	Page
WEE	ORAL SURG ORAL MED O	83	177	ARLEN JR	CHARO CLIN INT	1	45
ARTISAK AA	J PERIODONTAL RES	21	303	ALLER JS	CHARO	8	242
ARTISAK AA	J PERIODONTAL RES	22	315	ANDERSON GC	J PROSTHET DENT	53	392
ARTISAKOOCIORE A	PRIO PAIN RES PARAG	4	237	ARNHEIMLE T	LARYNX	1	411
ARTISAKOOCIORE AA	J OROPAC PAIN	9	218	ARTISAKOOCIORE A	TEMPOROMANDIBULAR DI	9	273
BROOKE SI	ADV PAIN RES THEO	9	309	ATKINSON AE	INT J ADULT DENTUR O	9	273
CHALLENGE J	DEBT MED J	301	?	BAILEY ZG	J DENT RES	59	317
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DANIELSON L	DIABD J DENT RES	90	151	BOARD JR	ORAL SURG ORAL MED O	67	222
DAL TTT	PAIN	16	61	BROOKE SI	ORAL SURG ORAL MED O	61	668
DUNNBER EF	CLIN J PAIN	4	89	BROOKE SI	CHARO	12	19
DUNNBER EF	J OROPAC PAIN	6	302	BRUCE JR	J PROSTHET DENT	70	31
DUNNBER EF	OROPAC PAIN THERO	15	15	CAPRANO JJ	J PROSTHET DENT	40	563
DUNNBER E	ACTA ODONTOL SCAND	56	122	CHAMPAN CR	EAR J ENTITUL SPANR	69	704
PERNE ZI	BRAIN ORAL FORTITURE	257		CHEN JC	ADULT DENT J	40	71
FORSSELL H	ACTA ODONTOL SCAND	44	63	CHEN JR	ORAL SURG ORAL MED O	78	204

We have learned:

A review being published in a highly reputable journal does not necessarily mean it is not biased

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Systematic reviews are not necessarily true or of relevance, but they may be repeatable

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Advantages of Systematic Reviews

- Reduce quantity of data
- Plan research, purchasing and guidelines
- Make efficient use of existing data
- Ensure generalisability
- Check consistency
- Explain inconsistency
- Quantify with meta-analysis
- Improve precision
- Reduce bias

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Systematic Reviews & Meta-analyses – in sum:

SHIT IN
SHIT OUT

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Dangers of systematic reviews and meta-analysis

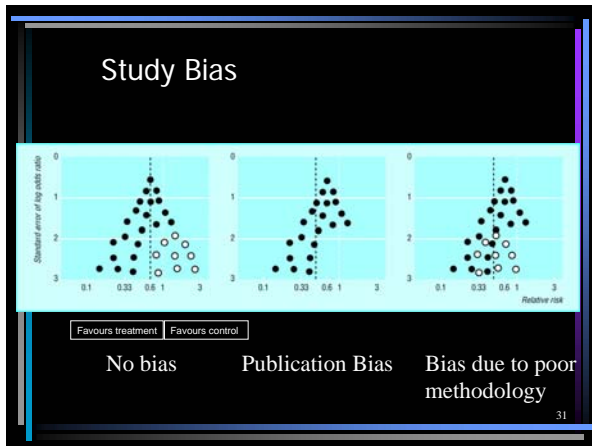
- Publication bias
 - Unpublished data
 - Covert duplicate publications
 - Limitation to positive findings
- Language bias
- Funding bias
- Study quality bias
- Retrieval bias – they remain “observational studies”

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Why does study bias matter?

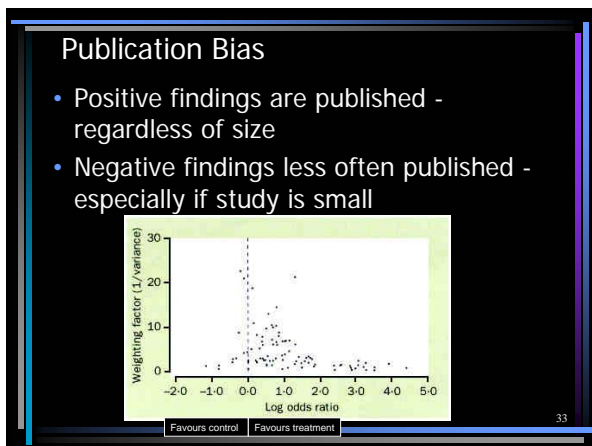
When bias leads to incorrect conclusions about the safety and efficacy of elements of clinical care, it raises not only scientific, but also ethical concerns.

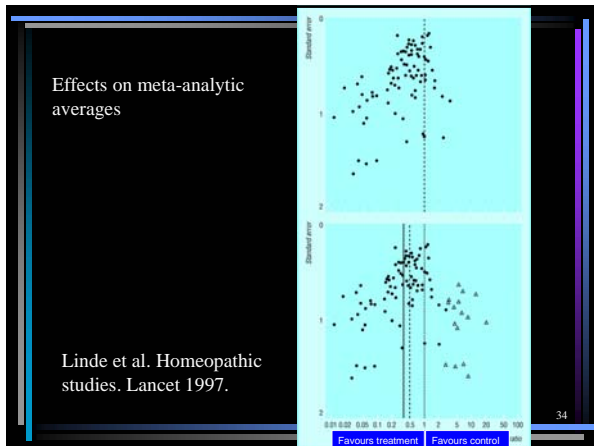
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Publication Bias

A tendency among investigators, peer reviewers and journal editors to allow the direction and statistical significance of research findings to influence decisions regarding submission and acceptance for publication.

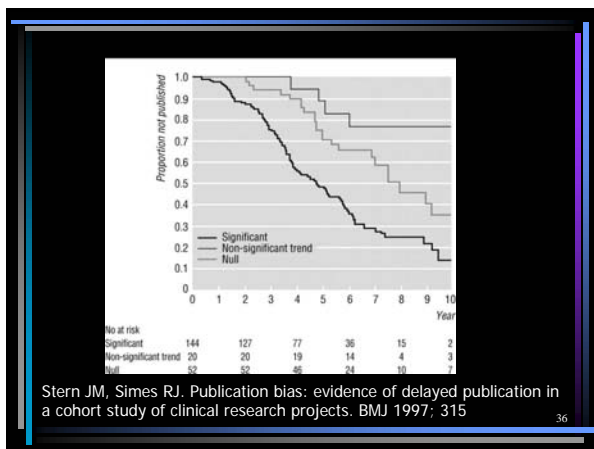




Reasons for Not Publishing

Reasons	%
Manuscript in the system" or published elsewhere	19
Non-significant results	15
Publication not aim of study	13
Incomplete analysis	11
Rejected manuscript	9
Too busy	9
Unimportant results	6
Funding source has the data	5

Dickersin & Meinert (1990) 35



Funding Bias

Article Conclusion	No. (% of Reviews)	
	Tobacco-Affiliated Authors (n = 31)	Non-Tobacco-Affiliated Authors (n = 75)
Passive smoking harmful	2 (6)	65 (87)
Passive smoking not harmful	29 (94)	10 (13)
Significance	$\chi^2 = 60.69; P < .001$	

Barnes & Bero. Why review articles on health effects of passive smoking reach different conclusions. JAMA 1998.

Outcome of Study	Studies Supported by a Drug Company (n = 40)	Studies Not Supported by a Drug Company (n = 112)
	n(%)	
Favorable	39 (98)	89 (79)
Not favorable	1 (2)	23 (21)

Cho & Bero. The Quality of Drug Studies Published in Symposium Proceedings. Ann Int Med, 1996.

* The proportion of studies with favorable outcomes was significantly higher for studies supported by a drug company than for studies without drug company support ($P < 0.01$).

Retrieval Bias - What causes it?

- Selective reading
 - trials showing statistically significant differences more likely to be read in journals
- Selective indexing
- Selective citation
 - reports showing positive features of a drug or therapy are more likely to be cited than those casting doubt on its value or safety

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Questions to ask:

- Was an adequate search strategy used?
- Were the inclusion criteria appropriate and applied in an unbiased way?
- Was a quality assessment of included studies undertaken?
- Were the characteristics and results of the individual studies appropriately summarised?
- Were the methods for pooling the data appropriate?
- Were sources of heterogeneity explored?

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