UPDATE ON RESEARCH AND CLINICAL GUIDELINES IN DENTISTRY 2025: VOL 5

Compiled by Johan Hartshorne[1] and Hugo Johan Kotzé[2]

Purpose: The purpose of this column is to highlight important research, advancements, and clinical guidelines in dentistry, published in the top impact dental & medical journals in 2025.

1. Antibiotics as immune modulators in periodontitis

- ***Field:*** Periodontology / Immunology
- ***Methodology:*** Narrative Review
- ***Clinical and practical significance:***

- Their benefits extend beyond antimicrobial effects and may also have a host-modulating role.
- Systemic antibiotics (e.g., metronidazole, amoxicillin + metronidazole, azithromycin) consistently reduce pocket depth and the need for surgical intervention.
- Resistance and uncertainty around dose- and time dependent effects require careful prescribing.

- ***Key findings:***

- Antibiotics influence periodontal healing not only by altering the subgingival microbiome but also by modulating innate and adaptive immune responses (e.g., neutrophils, macrophages, T and B cells).
- These immuno-modulatory properties may partly explain their strong clinical efficacy in periodontitis

- ***Reference:*** Suárez LJ, Arce RM, Furquim CP, et al. Antibiotic-mediated immune modulation in periodontitis. Periodontology 2000. 2025;00:1-28. https://doi.org/10.1111/prd.70011

2. Surgical versus non-surgical treatment of periodontitis

- ***Field:*** Periodontology
- ***Methodology:*** Narrative Review
- ***Clinical and practical significance:***

- Non-surgical periodontal therapy remains the first-line treatment of periodontitis.
- Residual 4–5 mm pockets should be managed with repeat subgingival instrumentation.
- Residual ≥6 mm pockets are indications for surgery.
- The CAL stability is a more relevant endpoint than probing depths (PD) or bleeding on probing (BOP) alone.

- ***Key findings***

- Evidence shows PD is not a reliable predictor of disease progression.
- The CAL measurement, though technically challenging and time-consuming, is the most valid endpoint for guiding retreatment and supportive periodontal care.

- ***Reference:*** Pihlstrom BL. Surgical Versus Non-Surgical Treatment of Periodontitis: The Past, the Present, the Future. J Periodontal Res. 2025;60(6):519-523. https://doi.org/10.1111/jre.70017

3. Biodentine vs MTA for pulpotomy in primary teeth

- ***Field:*** Endodontics (Paediatric)
- ***Methodology:*** Systematic Review & Meta-analysis of Randomized Controlled Trials
- ***Clinical and practical significance:***

- Both Biodentine and MTA are safe and effective materials for pulpotomy in primary teeth.
- Biodentine provides similar success to MTA but is often easier to use in practice due to quicker setting and lower discoloration risk.

- ***Key findings:***

- Eleven RCTs with follow-up of 6–24 months were included.
- No significant difference in clinical or radiographic success between Biodentine and MTA.
- Both materials demonstrate high overall success rates, supporting their use as effective alternatives to traditional pulpotomy agents.

- ***Reference:*** Lu KY-F, Gibbs JL, Wu C-Y, et al. Efficacy of Biodentine versus mineral trioxide aggregate in pulpotomy for primary teeth: a systematic review and meta-analysis of randomized controlled trials. J Evid-Based Dent Pract. 2025; 102191. https://doi.org/10.1016/j.jebdp.2025.102191

4. Direct pulp capping materials – comparative success

- ***Field:*** Endodontics
- ***Methodology:*** Network Meta-Regression of Randomized Clinical Trials
- ***Clinical and practical significance:***

- Calcium silicate cements (Biodentine, MTA) achieve higher and more predictable outcomes than calcium hydroxide for direct pulp capping.
- A high-quality coronal seal remains essential for success regardless of the material used.
- Other materials (TheraCal LC, CEM cement, light-cured $Ca(OH)_2$) lack sufficient evidence to support routine use.

- ***Key findings***

- Analysis of 21 RCTs including 1733 patients.
- Biodentine and MTA ranked highest for clinical success in network metaanalysis.
- Calcium hydroxide demonstrated lower and less reliable outcomes.
- Certainty of evidence is low, and long-term outcomes remain uncertain, indicating a need for further high-quality, multicentre trials.

- ***Reference:*** Hatipoğlu Ö, Tekingür EV, Hatipoğlu FP. Comparative clinical success of direct pulp capping materials: a network meta-regression of randomized clinical trials. J Dent. 2025;162:106073. https://doi.org/10.1016/j.jdent.2025.106073

[1] Johan Hartshorne, B.Sc., B.Ch.D., M.Ch.D., M.P.A., Ph.D. (Stell), FFPH.RCP (UK) General Dental Practitioner Intercare Medical and Dental Centre, Tyger Valley, Bellville, South Africa, 7530. Email: johan.laptop@intercare.co.za

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5. Safety of tooth bleaching in children and adolescents

- ***Field:*** Aesthetic Dentistry / Paediatric Dentistry
- ***Methodology:*** Scoping Review
- ***Clinical and practical significance:***

- Both vital and non-vital bleaching procedures appear safe and effective for children and adolescents when properly indicated.
- Side effects, mainly sensitivity and gingival irritation, are generally mild and transient.
-Technique and concentration should be individualized according to the severity of discoloration, patient compliance, and cost.

- ***Key findings:***

- 40 studies (n=1,042; ages 3–18) which included hydrogen peroxide 6–36%, carbamide peroxide 10–44%, sodium perborate, 5% NaOCl, and McInnes solution. Delivery via in-office trays, at-home trays, OTC strips, walking bleach, and inside/outside techniques were assessed.
- Hydrogen peroxide and carbamide peroxide are most studied; higher concentrations may have better results but are not always superior to lower concentrations.
- At-home and OTC methods are linked with more gingival irritation, while in-office bleaching offers better control and shorter treatment times.
- Evidence base is heterogeneous: inconsistent outcome measures, lack of validated pain/sensitivity scales, and limited direct comparisons between techniques.

- ***Reference:*** Lopes CMMT, de Oliveira FJD, Lucena e Silva TC, et al. Are tooth bleaching procedures safe for children and adolescents? A scoping review of color change, side effects, and impact on patient satisfaction. Journal of Dentistry.2025;159:105794. https://doi.org/10.1016/j.jdent.2025.105794

6. Use and efficacy of air powder water jet devices in surgical peri-implantitis treatment

- ***Field:*** Implantology
- ***Methodology:*** Laboratory Simulation Study
- ***Clinical and practical significance:***

- Air-powder water-jet (APWJ) devices (Airflowing) can aid implant surface cleaning during surgical peri-implantitis therapy.
- Debridement success with APWJ devices is dictated by defect morphology and handpiece choice, not device power or implant surface.
- Supramucosal handpieces are recommended for horizontal defects; submucosal handpieces for deep intraosseous defects, with ≥15 seconds of instrumentation per sextant.
- Clinicians should adapt airflowing protocols to defect anatomy rather than relying on fixed, short treatment times.

- ***Key findings:***

- In horizontal defects, supramucosal handpieces achieved high levels ofsurface cleaning with standard settings.
- In intraosseous defects, only the submucosal handpiece was effective, provided instrumentation was prolonged (≥15 s per sextant).
- Implant surface type (turned vs modified) and device power level had no meaningful impact on cleaning efficacy.
- Complete removal of biofilm was not achieved under any condition, indicating limitations of APWJ as the only method for implant decontamination.

- ***Reference:*** Stavropoulos A, Al Said A, Mustafa O, et al. Factors affecting the efficacy of airflowing in cleaning implant surfaces in a surgical peri-implantitis treatment simulation. Clin Oral Implants Res. 2025;36(9):1146-1158. https://doi.org/10.1111/clr.14464

7. Use and efficacy of air-powder water-jet devices in non-surgical peri-implantitis treatment

- ***Field:*** Implantology
- ***Methodology:*** Laboratory Simulation Study
- ***Clinical and practical significance:***

- Non-surgical debridement with APWJ devices is more effective on turned implant surfaces than on modern modified surfaces.
- Extended instrumentation time (≥15 s per sextant) improves cleaning in nonsurgical management.
- Device or powder type appears less important than surface characteristics and sufficient treatment duration.

- ***Key findings:***

- Turned implants showed significantly lower residual biofilm than modified implants; some turned implants were completely clean after 15 s per sextant.
- Modified surfaces could not be completely decontaminated under any tested condition.
- Longer instrumentation time reduced residual biofilm more effectively than the commonly recommended 5 s per sextant.
- Biofilm persisted mainly in apical regions of the defects.
- There were no major differences between the two tested APWJ devices or their powders (glycine vs erythritol).

- ***Reference:*** Bertl K, Isik A, Truong T, et al. Efficacy of air powder water-jet devices in cleaning implant surfaces in a non-surgical peri-implantitis treatment simulation. Clin Oral Implants Res. 2025;36(9):1075-1085. https://doi.org/10.1111/clr.14452

[2] Hugo Johan Kotzé, BDS (UWC) General Dental Practitioner
Intercare Medical and Dental Centre, Tygervalley, Bellville, South Africa, 7530. Email: hugokotze17@gmail.com