Roughness and loss of substance of tooth surfaces after biofilm removal with different processing methods

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Aim
To assess the roughness and loss of substance of tooth surfaces after instrumentation with Airflow, ultrasonics, hand instruments and polishing methods or their different combinations. This was a pilot study.

Materials and methods
Post extraction, impacted 3rd molars were marked and stored teeth were then divided and subjected to the following treatments:

1A – Airflow EMS PLUS powder at 2 mm distance for 5 sec with a pressure of 1.8 bar at an angle of 45° with a wiping movement
1B – Airflow EMS PLUS powder + conventional polishing with rubber cup and polishing paste of varying RDA 70/70/14/17
2A – Ultrasonic EMS with PS instrument for 60 sec/surface, brush-stroke movements, pressure ~ 30 p
2B – Ultrasonic + Airflow EMS PLUS powder used as above
2C – Ultrasonic + conventional polishing used as above
3A – Hand scaler / curette. On enamel scaler curved. On root Gracey curette from Deppeker blue, scaling movement per position one stroke
3B – scaler / curette + Airflow EMS PLUS powder as above
3C – scaler + Airflow EMS PLUS powder + Conventional polishing as above
3D – scaler + conventional polishing as above

Substance loss and roughness were assessed 2 control groups: enamel untreated, cementum untreated

Results
On enamel: Group 1: Airflow
• There are no additional benefits in conventional polishing and Airflow in comparison to using AIRFLOW alone

Group 2: Ultrasonic
• In comparison to Air-Flow, all other instrumentations produced small roughness values. Additional conventional polishing does not alter the overall results.

Group 3: Hand instrument
• Hand instrument scaler also causes a loss of substance in the enamel. No additional improvement by additional instrumentation with Air-flow, conventional polishing or a combination of both.

On cementum: Group 1: AirFlow
Slight roughness due to additional conventional polishing.

Group 2: Ultrasonic
Ultrasonic produces a smooth cementum surfaces with low roughness values, which are not significantly altered by combinations with Airflow or conventional polishing.

Group 3: Hand instrument
Gracey curette: A smooth surface is produced of the processed cementum, addition of Air-Flow worsens the result, polishing measures as already described above lead to an apparently smoother surface.

Conclusions
• Airflow with PLUS powder produces the highest level of cleaning on enamel and cementum in comparison to ultrasonics or hand instrumentation.
• Repeated instrumentation, too high pressure and too long exposure times lead to high substance loss with all systems.
• Use of conventional instrumentation leads of unnecessary over instrumentation especially in use on ceramics or restorations.
• Airflow is the most efficient solution providing maximum tooth preservation.
• Ultrasound and hand instruments enable a stripe-shaped cleaning pattern through punctiform contact with the tooth surface. A planar pattern is achieved with Air-Flow. This makes it easier to achieve a homogeneous result on large surfaces. This is much more difficult with ultrasonics and hand instruments and quickly leads to grooves and furrows.

Recommended treatment approach is:
• Assessment followed by disclosure for motivation
• Deep cleaning with Airflow followed by ultrasonic if necessary
• Quality check for remaining stains, biofilm or calculus

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