

Letters From Our Readers

To: Editor, *The Angle Orthodontist*

Re: Pulp blood flow and sensibility in patients with a history of dental trauma undergoing maxillary expansion. Raymond Lam; Mithran S. Goonewardene and Steven Naoum. *Angle Orthod.* 2020; 90:695–701.

We thank Drs Gupta, Singh and Tripathi for their interest and comments on our study. We appreciate your analysis and would like to offer the following comments.

We acknowledge that pulp blood flow (PBF) is impacted by menstruation and this may have affected our results. Since our study was prospective and observational without interference to the delivery of care, testing occurred at regularly scheduled appointments made by the treating clinician. If we timed our assessment to coincide with periods of menstruation, treatment would have been delayed and adhering to our turning protocol at T2 would be affected as this was the period of rapid maxillary expansion (which was fixed at 10 days following initial activation). As our testing period was random to the menstruation cycle, we hope this would have equal randomization and effect between the testing intervals. Although we did not publish our results by gender, we can confirm that there were no significant differences in PBF between males and females. Having said this, we agree that it would have been ideal to consider menstruation in the study. With regards to having 60% of our patients being female, our prospective trial aimed to simulate the clinical situation as realistic as possible and this is the gender composition that presented.

We did evaluate closure of the root apices and other variables on an inter-tooth level, but these considerations were not reported. As mentioned, we do expect those teeth with constricted apical foramina with trauma to be more susceptible to strangulation of apical vessels compared to teeth with narrow apical foramina. Similarly, we would also expect teeth with cumulative injuries, or those with more severe injuries such as complicated crown fractures, as opposed to uncomplicated crown fractures, to have a worse prognosis. However, as stated in our aims, we were focused on changes in pulp blood flow on healthy and traumatized teeth for that tooth in question with its circumstances rather than a comparison between different teeth. This is the first study on rapid maxillary

expansion (RME) and trauma and we hope to quantify these considerations in a further study. As stated in our limitations, our sample size did not permit such an inter-tooth analysis with statistical significance.

With regards to teeth being subjected to circadian rhythm, measurements were taken in the afternoon from 2-5 pm in our *Early Treatment Clinic*; a clinic focused on early intervention. This was not clarified in detail and perhaps we erred by trying to oversimplify the writing.

In terms of expansion protocol, this is the standard turning protocol used by all clinicians in this hospital. Again, this is an observational study and we are not trying to change the delivery of treatment. Furthermore, adopting this protocol ensured consistency in our results.

The stage of mid-palatal maturation was not assessed before RME as this was not the standard in this hospital. However, other growth predictors such as cervical vertebral maturation (CVM), height, weight, physical characteristics, menarche to suggest a few, were recorded as part of the standard protocols in treatment planning in the department. As discussed, patients who had been treatment planned from such records and required RME were then invited to participate in this study. All patients in this study achieved the desired expansion.

As with all pulp sensibility and vitality tests, there is no perfect method and all current methods have limitations. With laser Doppler flowmetry (LDF), it is accepted that contamination from fluids such as blood, gingival crevicular fluid or saliva could affect PBF. Rubber dam was not used because we felt that it introduced too much uncertainty in controlling other variables and for logistical reasons. In patients with a constricted maxilla, significant irregularities exist between teeth such as palatally displaced laterals or buccally blocked out and partially erupted canines that are high in the sulcus, making rubber dam placement difficult especially when testing a continuous segment of teeth. Placing a rubber dam during different time intervals when teeth may have moved could introduce other variables. Different pressures from the tension/stretch of the rubber dam especially at T1 when crowding was more apparent could have affected the results with different hole punch distances for the assessed teeth. A rubber dam clamp, if used, may cause gingival bleeding or added pressure

to the teeth and it was difficult to ensure that the same clamp was used for each of the 6 teeth during each testing interval. It was also difficult to test teeth with a rubber dam and clamp in teeth that were not in occlusion. When such irregularity exists, it is difficult to ensure seating of the jig in its reproducible position with a rubber dam. Rubber dam and clamp placement may also give a different response to electric pulp testing. As we only tested the 6 upper anterior teeth, it was simple to ensure that no pooling of saliva occurred, and that adequate seating of the jig was ensured. Testing at a reproducible position of 3mm from the gingival margin in the upper teeth with easy

access enabled us to ensure that the field was free of significant contamination. We speculate that these were the same considerations in other studies on pulp flow and expansion as to why a rubber dam was not used.

We once again thank the Drs for their critical appraisal and comments. We will certainly make improvements for any follow-up studies.

*Raymond Lam, Mithran S. Goonewardene,
Steven Naoum*

*Orthodontics, Dental School, The University of
Western Australia, Nedlands, Australia*